



Fiscal Year 2020
Actuarial Valuation Report
for the
New York City
Teachers' Retirement System

JUNE 30, 2018 (LAG) ACTUARIAL VALUATION

prepared by the
New York City
Office of the Actuary

2020



OFFICE OF THE ACTUARY

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SHERRY S. CHAN
CHIEF ACTUARY

August 24, 2020

Board of Trustees
New York City Teachers' Retirement System
55 Water Street, 16th Floor
New York, NY 10041

Re: Fiscal Year 2020 Actuarial Valuation Report (Report)

Dear Trustees:

This Report presents the results of the June 30, 2018 (Lag) actuarial valuation of the benefits under both the New York City Teachers' Retirement System (TRS) and Group Life Insurance Plan (collectively, the Plan). This valuation, known as the June 30, 2018 (Lag) valuation, forms the basis for determining the statutorily-required contribution (Statutory Contribution) of \$3,590,801,261 for Fiscal Year 2020 (i.e. for the period beginning July 1, 2019 and ending June 30, 2020). It is not intended, nor necessarily suitable, for other purposes. Calculations made for other purposes may differ significantly from those shown herein.

Results of the June 30, 2017 (Lag) actuarial valuation are shown in this Report for comparative purposes. Other historical information that the Actuary believes useful is also included.

The June 30, 2018 (Lag) and June 30, 2017 (Lag) actuarial valuations are based upon census data as of those dates submitted by the Plan's administrative staff and the employer's payroll facilities. Financial information was provided by TRS and the Office of the Comptroller as of June 30, 2018 and June 30, 2017.

Consistent with Actuarial Standards of Practice, the Office of the Actuary has reviewed census data and financial information for consistency and reasonability but has not audited it. The accuracy of the results and calculations presented in this Report are dependent on the accuracy of this census data and financial information. To the extent any such data or information provided is materially inaccurate or incomplete, the results contained herein will require revision.

A summary of the benefits available under the terms of the Plan is shown in SECTION VIII – SUMMARY OF PLAN PROVISIONS. The benefits under the Plan are unchanged from the prior valuation.

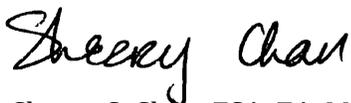
A summary of the actuarial assumptions and methods used in the valuation of the Plan is shown in SECTION XI – ACTUARIAL ASSUMPTIONS AND METHODS. The assumptions and

methods used for the June 30, 2018 valuation were presented in the report titled “Proposed Changes in Actuarial Assumptions and Methods Used in Determining Employer Contributions for Fiscal Years Beginning on and After July 1, 2018 for the New York City Teachers’ Retirement System” dated January 17, 2019 which was adopted by the Board of Trustees at the February 28, 2019 Board meeting. The actuarial assumptions and methods are unchanged from the prior year with the exception of the method for determining the Actuarial Value of Assets. Details describing this change can be found later in this Report.

This Report does not present Governmental Accounting Standards Board (GASB) results. The Office of the Actuary will publish Fiscal Year 2020 GASB67 and GASB68 results in a report later this year, which will be available on the website of the Office of the Actuary (www.nyc.gov/actuary).

I, Sherry S. Chan, am the Chief Actuary for, and independent of, the New York City Retirement Systems and Pension Funds. I am a Fellow of the Society of Actuaries, an Enrolled Actuary under the Employee Retirement Income and Security Act of 1974, a Member of the American Academy of Actuaries, and a Fellow of the Conference of Consulting Actuaries. I meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion contained herein. To the best of my knowledge, the results contained herein have been prepared in accordance with generally accepted actuarial principles and procedures and with the Actuarial Standards of Practice issued by the Actuarial Standards Board.

Best Regards,



Sherry S. Chan, FSA, EA, MAAA, FCA
Chief Actuary

SSC/eh

cc: Ms. Valerie Budzik - New York City Teachers’ Retirement System
Ms. Dolores Capone - New York City Office of the Actuary
Mr. Craig Chu - New York City Office of the Actuary
Mr. Thad McTigue - New York City Teachers’ Retirement System
Ms. Patricia Reilly - New York City Teachers’ Retirement System
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SECTION I – EXECUTIVE SUMMARY

This Report presents the results of the June 30, 2018 (Lag) actuarial valuation of the New York City Teachers' Retirement System (TRS) Qualified Pension Plan and Group Life Insurance Plan (collectively, the Plan).

The purposes of the valuation are:

- To determine the actuarially-required contribution (Actuarial Contribution) for Fiscal Year 2020 (i.e. July 1, 2019 to June 30, 2020),
- To measure the funding progress of the Plan,
- To disclose the census data and financial information used in the valuation, and
- To disclose the actuarial assumptions and actuarial methods used to determine the Actuarial Contribution.

The statutorily-required contribution (Statutory Contribution) is also shown and compared to the Actuarial Contribution in historical years.

This Report does not provide financial and accounting information required by current GASB standards. That information is provided in a separate report.

Future measurements of this information may differ from current measurements for many reasons including, but not limited to, experience differing from economic or demographic assumptions, changes in actuarial assumptions and methods, and changes in applicable statute and plan provisions. These and additional risks may be present for the Plan. A further discussion is presented in SECTION VII – RISK AND UNCERTAINTY for consideration.

Table I-1 Executive Summary

Presented in **Table I-1** are the principal results of the June 30, 2018 (Lag) actuarial valuation and, for comparative purposes, the June 30, 2017 (Lag) actuarial valuation.

NEW YORK CITY TEACHERS' RETIREMENT SYSTEM		
SUMMARY OF VALUATION RESULTS		
Valuation Date	June 30, 2018 (Lag)	June 30, 2017 (Lag)
Fiscal Year	2020	2019
Funded Status		
1. Accrued Liability	\$ 72,205,318,401	\$ 69,552,380,259
2. Actuarial Value of Assets (AVA) ¹	<u>50,012,149,000</u>	<u>44,381,706,000</u>
3. Unfunded Accrued Liability (AVA Basis) (1. - 2.)	\$ 22,193,169,401	\$ 25,170,674,259
4. Funded Ratio (AVA Basis) (2. / 1.)	69.3%	63.8%
5. Market Value of Assets (MVA) ¹	54,532,476,000	50,095,723,000
6. Unfunded Accrued Liability (MVA Basis) (1. - 5.)	\$ 17,672,842,401	\$ 19,456,657,259
7. Funded Ratio (MVA Basis) (5. / 1.)	75.5%	72.0%
Contribution		
1. Normal Cost	\$ 1,358,558,635	\$ 1,305,407,961
2. Unfunded Accrued Liability	2,201,365,303	2,358,531,955
3. Administrative Expenses	56,397,773	58,245,643
4. ASAF Credit	(25,500,000)	(25,500,000)
5. BOE Pre-payment Credit	<u>(20,450)</u>	<u>N/A</u>
6. Actuarial Contribution (1. + 2. + 3. + 4. + 5.)	\$ 3,590,801,261	\$ 3,696,685,559
7. Statutory Contribution	\$ 3,590,801,261	\$ 3,696,685,559
Participant Data		
1. Active Members		
a. Number	121,764	120,826
b. Annual Salary	\$ 10,404,403,684	\$ 9,848,899,232
c. Average Salary	\$ 85,447	\$ 81,513
2. Active Off Payroll Members ²	9,416	7,997
3. Terminated Vested Members	16,433	15,279
4. Retirees and Beneficiaries		
a. Number	86,295	84,770
b. Total Annual Benefits	\$ 4,234,276,918	\$ 4,097,647,362
c. Average Benefit	\$ 49,067	\$ 48,338

¹ Actuarial Value of Assets and Market Value of Assets are rounded to the nearest thousand.

² Represents members no longer on payroll, but not otherwise classified.

Table I-2
Actuarial Liabilities

NEW YORK CITY TEACHERS' RETIREMENT SYSTEM		
ACTUARIAL LIABILITIES BY STATUS		
Valuation Date	June 30, 2018 (Lag)	June 30, 2017 (Lag)
Fiscal Year	2020	2019
Accrued Liability		
1. Active Members	\$ 27,097,508,402	\$ 25,446,203,461
2. Active Off Payroll Members ¹	556,523,957	620,993,800
3. Terminated Vested Members	1,394,420,845	1,125,301,165
4. Retirees and Beneficiaries	<u>43,150,865,197</u>	<u>42,149,683,579</u>
5. Accrued Liability Pre-Adjustments (1. to 4.)	\$ 72,199,318,401	\$ 69,342,182,005
6. Actuarial Adjustments ²	<u>6,000,000</u>	<u>210,198,254</u>
7. Total Accrued Liability (AL) (5. + 6.)	\$ 72,205,318,401	\$ 69,552,380,259
Present Value of Benefits		
1. Active Members	\$ 44,557,292,753	\$ 41,904,123,400
2. Active Off Payroll Members ¹	556,523,957	620,993,800
3. Terminated Vested Members	1,394,420,845	1,125,301,165
4. Retirees and Beneficiaries	<u>43,150,865,197</u>	<u>42,149,683,579</u>
5. Present Value of Benefits (1. to 4.)	\$ 89,659,102,752	\$ 85,800,101,944
6. Actuarial Adjustments ²	<u>6,000,000</u>	<u>210,198,254</u>
7. Total Present Value of Benefits (5. + 6.)	\$ 89,665,102,752	\$ 86,010,300,198

¹ Represents members no longer on payroll, but not otherwise classified.

² Related to actuarial loading adjustments.

Graph I-3
Historical Funded Status



SECTION II – MARKET AND ACTUARIAL VALUES OF ASSETS

Information on the Market Value of Assets (MVA) of the Plan is provided by the Office of the Comptroller. An Actuarial Asset Valuation Method (AAVM) is used to determine the Actuarial Value of Assets (AVA) of the Plan.

The Actuary reset the AVA to the market value as of June 30, 2011. Beginning with the June 30, 2012 (Lag) actuarial valuation, the AAVM recognizes investment returns greater or less than expected over a period of six years. In accordance with this AAVM, Unexpected Investment Returns (UIR) are phased into the AVA at rates of 15%, 15%, 15%, 15%, 20%, and 20% per year (i.e. UIR is recognized at cumulative rates of 15%, 30%, 45%, 60%, 80%, and 100% over a period of six years).

UIR is defined as the excess of net investment return over the Expected Investment Return (EIR) based on the expected rate of return and the AVA, where EIR equals the sum of beginning-of-fiscal-year AVA plus one-half of net cash flow, multiplied by the expected rate of return.

Beginning with the June 30, 2014 (Lag) actuarial valuation, the AVA is further constrained to be within a corridor of 80% to 120% of the market value.

Beginning with the June 30, 2018 (Lag) actuarial valuation, the Actuarial Value of Assets is determined by re-characterizing the interest credited on TDA Fixed Fund account balances as investment income instead of as a cash disbursement.

Table II-1
Statement of Plan Net Assets

(\$ Thousands)		
	June 30, 2018	June 30, 2017
ASSETS		
Cash	\$ 75,847	\$ 101,499
Receivables		
Investment Securities Sold	\$ 839,544	\$ 989,725
Member Loans	312,219	298,146
Accrued Interest and Dividends	<u>273,387</u>	<u>164,163</u>
Total Receivables	\$ 1,425,150	\$ 1,452,034
INVESTMENTS AT FAIR VALUE		
Pooled NYC Pension Fund Assets (Fixed-Return Fund)		
Short-Term Investments		
Commercial Paper	\$ 6,487	\$ 230,093
Short-term Investment Fund	1,578,263	557,945
U.S. Treasury Bills & Agencies	0	0
Discount Notes	111,733	282,248
Debt Securities		
U.S. Government	13,288,993	7,947,669
Corporate & Other	7,016,574	7,753,224
Equity Securities		
	20,536,514	21,086,002
Alternative Investments		
	8,926,759	7,523,885
Collective Trust Funds		
Fixed Income	1,848,081	1,791,033
International Equity	15,436,970	15,734,149
Mortgage Debt Security	555,508	495,540
Treasury Inflation Protected Securities	3,106,109	2,682,432
Collateral from securities lending (Fixed Return Fund)	1,048,388	1,530,310
Diversified Equity Fund		
Short-Term Investments	135,558	65,825
Equity Securities	6,125,780	6,031,258
Debt Securities	127,150	106,307
Bond Fund		
Short-Term Investments	849	3,576
Equity Securities	70,562	0
Debt Securities	0	83,333
International Equity Fund		
Short-Term Investments	80	53
Equity Securities	12,076	12,436
Inflation Protection Fund		
Short-Term Investments	3	23
Equity Securities	4,596	4,761
Socially Responsive Equity Fund		
Short-Term Investments	453	662
Equity Securities	11,654	11,320
International equity	717	516
Collateral from securities lending (Variable Return Fund)	<u>69,204</u>	<u>80,011</u>
TOTAL INVESTMENTS	\$ 80,019,061	\$ 74,014,611
OTHER ASSETS	<u>62,852</u>	<u>38,932</u>
TOTAL ASSETS	\$ 81,582,910	\$ 75,607,076
LIABILITIES		
Accounts Payable	\$ 643,567	\$ 529,059
Payable for Investment Securities Purchased	1,568,064	1,353,803
Accrued Benefits Payable	13,858	13,987
Due to TDA Program's Fixed Return Fund	23,707,352	22,004,183
Security Lending	<u>1,117,593</u>	<u>1,610,321</u>
TOTAL LIABILITIES	\$ 27,050,434	\$ 25,511,353
PLAN ASSETS HELD IN TRUST FOR PENSION BENEFITS	\$ 54,532,476	\$ 50,095,723

Table II-2
Statement of Changes in Plan Net Assets

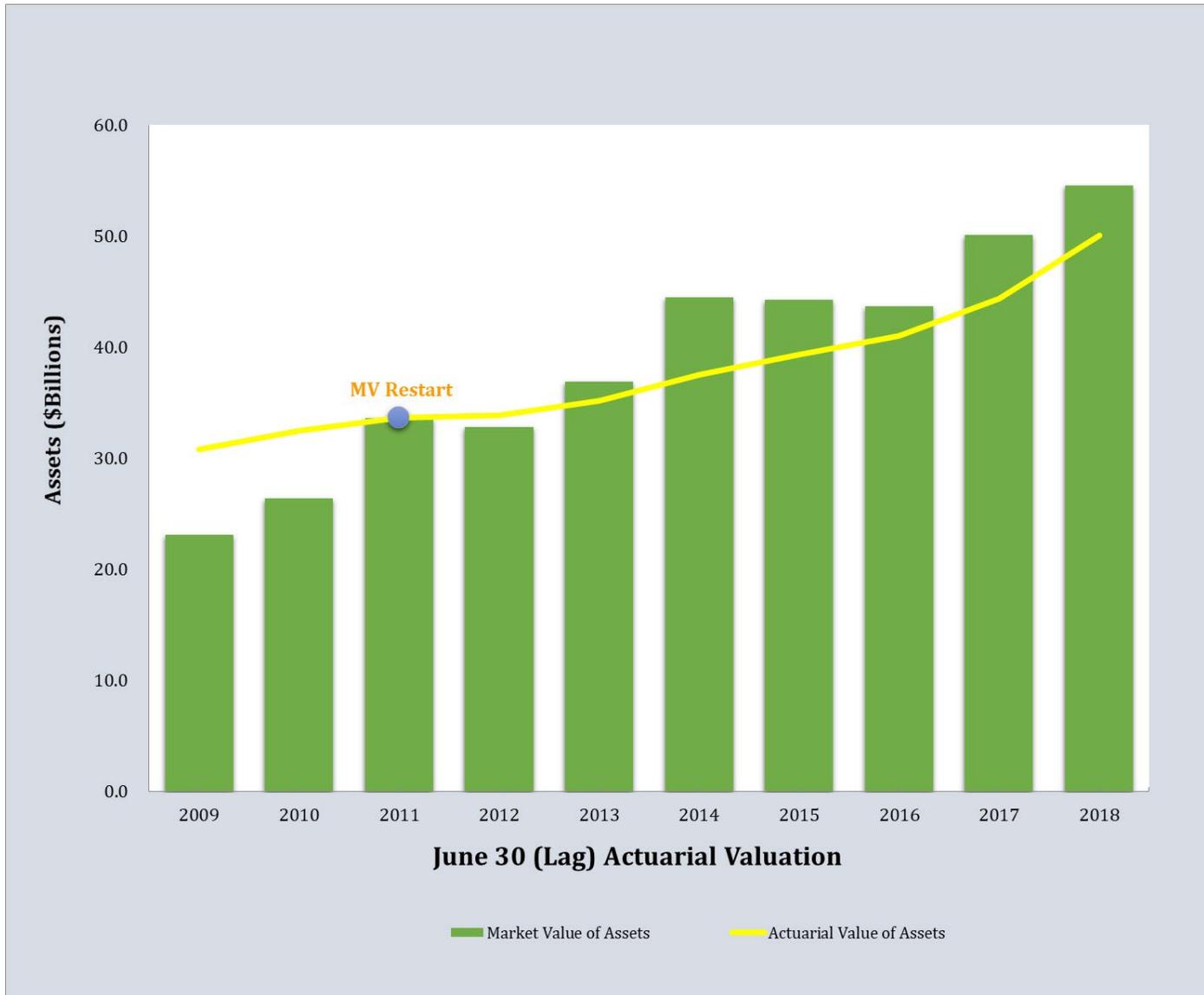
(\$ Thousands)		
	June 30, 2018	June 30, 2017
ADDITIONS		
Contributions		
Member Contributions	\$ 195,241	\$ 180,076
Employer Contributions	3,889,710	3,888,399
Other Employer Contributions ¹	<u>59,979</u>	<u>57,369</u>
Total Contributions	\$ 4,144,930	\$ 4,125,844
Investment Income		
Interest Income	\$ 1,330,009	\$ 932,169
Dividend Income	1,056,636	981,087
Net Appreciation in Fair Value of Investments	<u>4,223,813</u>	<u>6,516,379</u>
Total Investment Income	\$ 6,610,458	\$ 8,429,635
Less:		
Investment Expenses	\$ 356,269	\$ 316,180
Net (Decrease) in Fair Variable Expense Provision	<u>(5,601)</u>	<u>(2,379)</u>
Net Investment Income	\$ 6,259,790	\$ 8,115,834
Securities Lending Transactions		
Securities Lending Income	\$ 16,654	\$ 18,806
Securities Lending Fees	<u>(1,329)</u>	<u>(1,360)</u>
Net Securities Lending Income (Loss)	\$ 15,325	\$ 17,446
Other		
Net Receipts from (to) Other Retirement Systems	\$ (3,534)	\$ (2,291)
TOTAL ADDITIONS	\$ 10,416,511	\$ 12,256,833
DEDUCTIONS		
Benefit Payments and Withdrawals	\$ 4,351,924	\$ 4,219,312
Administrative Expenses	65,076	60,790
Other		
Interest from (to) TDA Program's Fixed Return Fund	\$ 1,595,462	\$ 1,466,615
TDA Rebalance	<u>\$ (32,704)</u>	<u>\$ 43,938</u>
TOTAL DEDUCTIONS	\$ 5,979,758	\$ 5,790,655
NET INCREASE (DECREASE) IN PLAN NET ASSETS	\$ 4,436,753	\$ 6,466,178
PLAN NET ASSETS HELD IN TRUST FOR PENSION BENEFITS		
Beginning of Year	\$ 50,095,723	\$ 43,629,545
End of Year	\$ 54,532,476	\$ 50,095,723

¹ Includes amounts for employer's portion of Additional Member Contributions and supplemental contributions for the ASAF and ASF Funds.

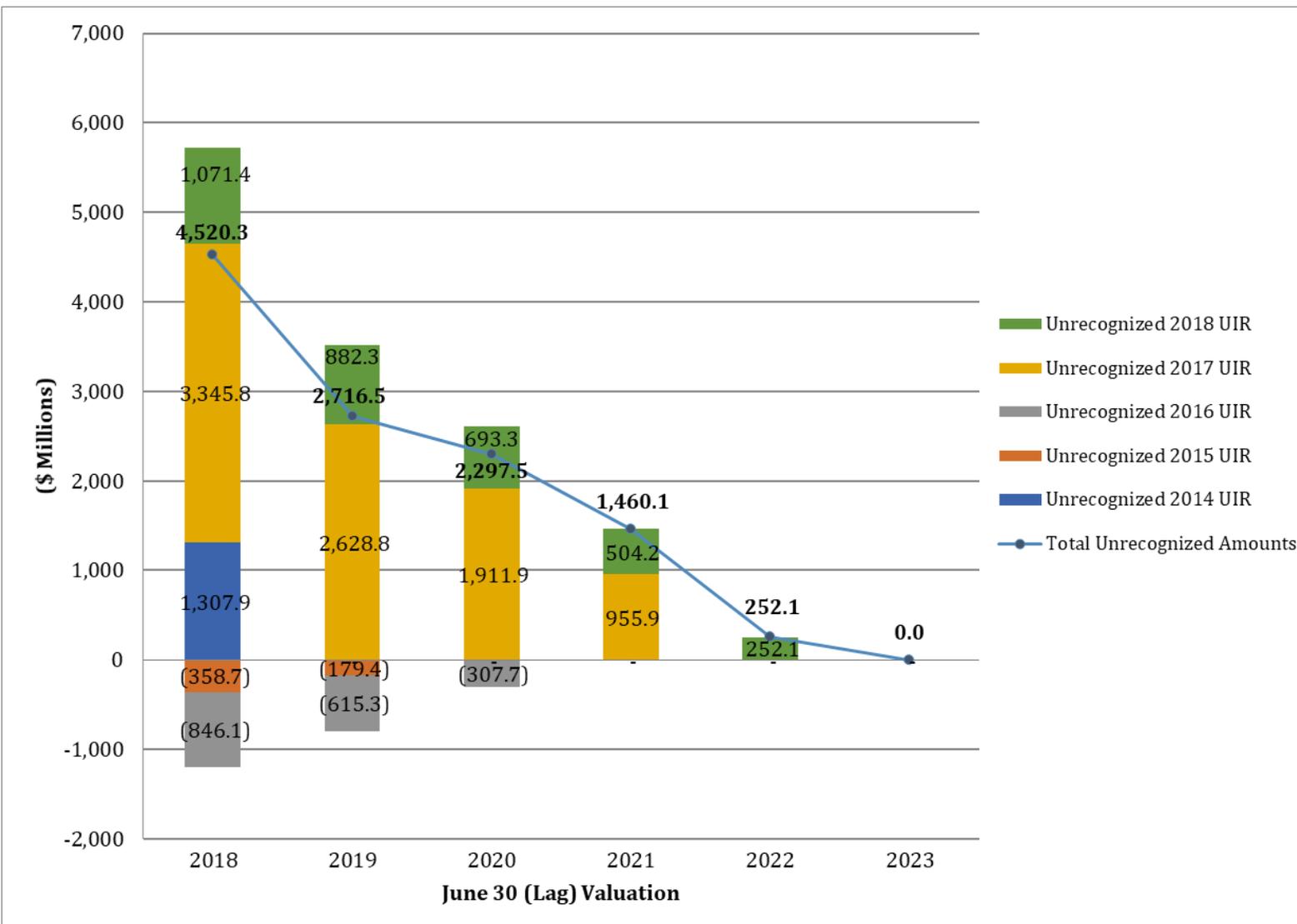
Table II-3
Development of Actuarial Value of Assets

(\$ Thousands)		
Valuation Date	June 30, 2018	June 30, 2017
Fixed Fund		
Market Value of Assets (MVA)		
Beginning of Year (BOY)	\$ 43,920,339	\$ 41,440,456
End of Year (EOY)	\$ 48,172,801	\$ 43,920,339
1. Contributions		
a. Employee	\$ 194,921	\$ 179,753
b. Employer	3,889,710	3,888,399
c. Other	<u>59,957</u>	<u>57,340</u>
d. Total Contributions	\$ 4,144,588	\$ 4,125,492
2. Net Investment Income		
a. Investment Income	\$ 4,294,576	\$ 7,638,086
b. Investment Expenses	<u>(348,905)</u>	<u>(310,246)</u>
c. Total Net Investment Income	\$ 3,945,671	\$ 7,327,840
3. Cash Flow (Other)	\$ (3,837,797)	\$ (8,973,449)
4. Net Cash Flow (1.d. + 3.)	\$ 306,791	\$ (4,847,957)
5. Average invested assets		
a. AVA @ BOY	\$ 38,206,322	\$ 38,825,998
b. 1/2 Net Cash Flow ((1.d. + 3.) / 2)	<u>153,396</u>	<u>(2,423,979)</u>
c. Total	\$ 38,359,718	\$ 36,402,019
6. Expected Rate of Return (AIR)	7.00%	7.00%
7. Expected Investment Return (EIR) (5.c. x 6.)	\$ 2,685,180	\$ 2,548,141
8. Unexpected Investment Return (UIR) (2.c. - 7.)	\$ 1,260,491	\$ 4,779,699
9. AVA @ EOY		
a. AVA @ BOY (prior to corridor limit)	\$ 38,206,322	\$ 38,825,998
b. Net Cash Flow (4.)	306,791	(4,847,957)
c. Expected Investment Return (7.)	2,685,180	2,548,141
d. Phase in of UIR		
15% * UIR for prior year	189,074	716,955
15% * UIR for second prior year	716,955	(230,748)
15% * UIR for third prior year	(230,748)	(134,530)
15% * UIR for fourth prior year	(134,530)	980,958
20% * UIR for fifth prior year	1,307,944	605,486
20% * UIR for sixth prior year	<u>605,486</u>	<u>(257,981)</u>
Total	\$ 2,454,181	\$ 1,680,140
e. Preliminary AVA (9.a. + 9.b. + 9.c. + 9.d.)	\$ 43,652,474	\$ 38,206,322
10. Corridor		
a. 80% of MVA	\$ 38,538,241	\$ 35,136,271
b. 120% of MVA	\$ 57,807,361	\$ 52,704,407
11. Final AVA of EOY (9e. bounded by 10)	\$ 43,652,474	\$ 38,206,322
12. Variable Assets	\$ 6,359,675	\$ 6,175,384
13. Total AVA @ EOY (11. + 12.)	\$ 50,012,149	\$ 44,381,706

Graph II-4
Historical Market and Actuarial Value of Assets



Graph II-5
Future Recognition of UIR as of June 30, 2018



SECTION III – CONTRIBUTION DEVELOPMENT AND HISTORY

Table III-1 Statutory Contributions

Table III-1 shows the components of the Fiscal Year 2020 and the Fiscal Year 2019 Statutory Contributions.

COMPONENTS OF CURRENT AND PRIOR FISCAL YEAR STATUTORY CONTRIBUTIONS		
Valuation Date	June 30, 2018 (Lag)	June 30, 2017 (Lag)
Fiscal Year	2020	2019
Normal Cost ¹	\$ 1,358,558,635	\$ 1,305,407,961
Amortization of Unfunded Accrued Liability		
-Initial UAL	1,953,375,091	1,896,480,672
-2011 (Gain)/Loss	157,298,501	157,298,501
-2012 (Gain)/Loss	92,094,332	92,094,332
-2013 (Gain)/Loss	244,357,693	244,357,693
-2014 (Gain)/Loss	117,417,036	117,417,036
-2014 Assumption Changes ²	224,142,498	224,142,498
-2015 (Gain)/Loss	86,869,581	86,869,581
-2016 (Gain)/Loss	(100,351,916)	(100,351,916)
-2017 (Gain)/Loss	(264,357,362)	(264,357,362)
-2017 ASAF Method Change	11,633,517	11,633,517
-2017 Assumption Changes ³	(107,961,163)	(107,961,163)
-2017 Method Changes ³	908,566	908,566
-2018 (Gain)/Loss	(73,585,040)	N/A
-2018 Method Change ⁴	(140,476,031)	N/A
Total	2,201,365,303	2,358,531,955
Administrative Expenses	56,397,773	58,245,643
ASAF Credit ⁵	(25,500,000)	(25,500,000)
Other Credit ⁶	(20,450)	N/A
Total Contribution to the New York City Teachers' Retirement System	\$ 3,590,801,261	\$ 3,696,685,559

¹ Includes amounts necessary, if any, to provide for financing of the Excess Benefit Plan established by Chapter 623/04.

² Change in post retirement mortality assumptions including the change to the mortality improvement scale MP-2015.

³ 2019 A&M.

⁴ Change in method of characterizing interest credited on TDA Fixed Fund account balances.

⁵ Estimated contribution made by the Department of Education to the Annuity Savings Accumulation Fund (ASAF) of certain eligible members.

⁶ Department of Education Pre-Payment credit for an excess received in 2016 due to the closing of Beginning With Children Charter School.

Table III-2
Schedule of Unfunded Accrued Liability Bases

The Initial Unfunded Accrued Liability (UAL) is being amortized over a closed 22-year period using Increasing Dollar Payments (IDP). Under IDP, amortization payments increase by 3.0% per year, consistent with the assumed rate of General Wage Increases. Increments to the UAL established after June 30, 2010 are generally amortized using Level Dollar Payments (LDP) as follows:

- Benefit Changes – Over the remaining working lifetimes of those impacted, unless the amortization period is determined by statute.
- Assumption and Method Changes – Over a closed 20-year period.
- Actuarial Gains and Losses – Over a closed 15-year period.

Under the One-Year Lag Methodology (OYLM), the number of payments is one fewer than the number of years in the amortization period (e.g. 14 payments over a closed 15-year amortization period).

Table III-2
Schedule of Unfunded Accrued Liability Bases (cont'd)

Table III-2 shows the Schedule of UAL Bases as of June 30, 2018.

NEW YORK CITY TEACHERS' RETIREMENT SYSTEM SCHEDULE OF UNFUNDED ACCRUED LIABILITY BASES						
Amortization Base	Date Established	Original Amount	Amortization Years	Amortization Payment	Payments Remaining	OYLM UAL June 30, 2018
Initial UAL	6/30/10	\$ 20,524,022,955	22	\$ 1,953,375,091	13	\$ 18,440,722,044
(Gain)/Loss	6/30/11	\$ 1,329,890,090	15	\$ 157,298,501	7	\$ 819,528,764
(Gain)/Loss	6/30/12	\$ 778,617,335	15	\$ 92,094,332	8	\$ 531,630,387
(Gain)/Loss	6/30/13	\$ 2,065,937,513	15	\$ 244,357,693	9	\$ 1,539,090,044
(Gain)/Loss	6/30/14	\$ 992,709,734	15	\$ 117,417,036	10	\$ 797,256,106
Assumption Change ¹	6/30/14	\$ 2,239,586,352	20	\$ 224,142,498	15	\$ 1,973,564,118
(Gain)/Loss	6/30/15	\$ 734,444,345	15	\$ 86,869,581	11	\$ 629,738,623
(Gain)/Loss	6/30/16	\$ (848,431,601)	15	\$ (100,351,916)	12	\$ (770,550,650)
(Gain)/Loss	6/30/17	\$ (2,235,025,973)	15	\$ (264,357,362)	13	\$ (2,135,913,883)
ASAF Method Change	6/30/17	\$ 116,239,745	20	\$ 11,633,517	18	\$ 113,129,982
Assumption Change ²	6/30/17	\$ (1,078,725,991)	20	\$ (107,961,163)	18	\$ (1,049,866,820)
Method Changes ²	6/30/17	\$ 9,078,212	20	\$ 908,566	18	\$ 8,835,344
(Gain)/Loss	6/30/18	\$ (622,129,323)	15	\$ (73,585,040)	14	\$ (622,129,323)
Method Change ³	6/30/18	\$ (1,403,608,000)	20	\$ (140,476,031)	19	\$ (1,403,608,000)

¹ Change in post-retirement mortality assumptions including the change to the mortality improvement scale MP-2015.

² 2019 A&M

³ Change in method of characterizing interest credited on TDA Fixed Fund account balances.

Graph III-3
Remaining UAL Amortizations as of June 30, 2018

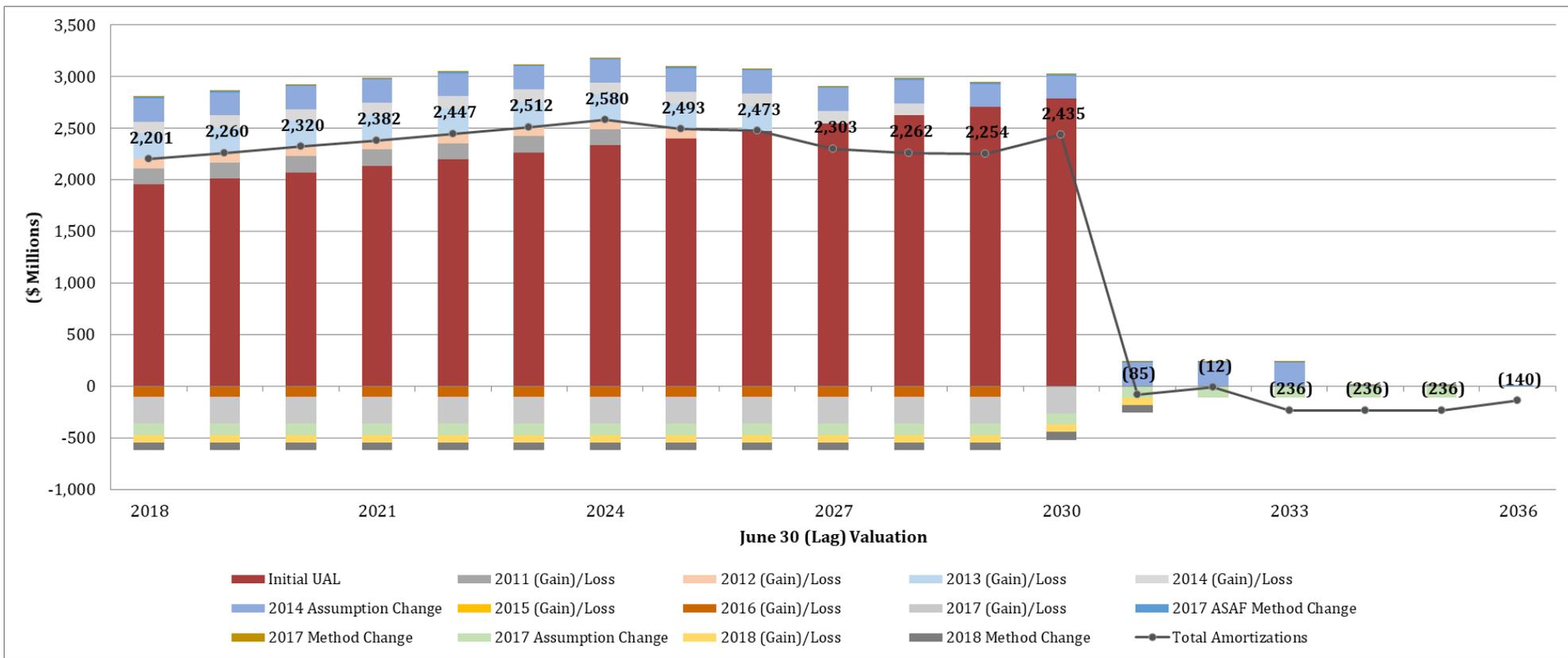


Table III-4
Reconciliation of Outstanding UAL Bases

June 30 (Lag) Valuation Date	Amounts (\$ Thousands) Remaining to be Amortized, as of								
	2010	2011	2012	2013	2014	2015	2016	2017 ¹	2018
Unfunded Accrued Liability, June 30, 2010	\$ 20,524,023	\$ 21,960,705	\$ 21,902,884	\$ 21,793,164	\$ 21,626,476	\$ 21,397,353	\$ 21,099,902	\$ 18,947,775	\$ 18,440,722
2011 (Gain)/Loss		1,329,890	1,422,983	1,359,880	1,292,361	1,220,116	1,142,813	908,033	819,529
ERI		5,793	6,199	4,803	3,309	1,710	0	0	0
2012 (Gain)/Loss			778,617	833,121	796,176	756,645	714,347	580,057	531,631
2013 (Gain)/Loss				2,065,937	2,210,553	2,112,526	2,007,638	1,659,177	1,539,090
2014 (Gain)/Loss					992,710	1,062,200	1,015,096	851,185	797,256
2014 Assumption Change					2,239,586	2,396,357	2,332,248	2,046,963	1,973,564
2015 (Gain)/Loss						734,444	785,855	667,027	629,739
2016 (Gain)/Loss							(848,432)	(810,808)	(770,551)
2017 (Gain)/Loss								(2,235,026)	(2,135,914)
2017 ASAF Method Change								116,240	113,130
2017 Assumption Change								(1,078,726)	(1,049,867)
2017 Method Change								9,078	8,835
2018 (Gain)/Loss									(622,129)
2018 Method Change									(1,403,608)
Sum of Outstanding Amortization Amounts	\$ 20,524,023	\$ 23,296,388	\$ 24,110,683	\$ 26,056,905	\$ 29,161,171	\$ 29,681,351	\$ 28,249,467	\$ 21,660,975	\$ 18,871,427

June 30 (Lag) Valuation Date	2010	2011	2012	2013	2014	2015	2016	2017	2018
1. Accrued Liability (AL)	\$ 55,138,366	\$ 57,702,731	\$ 58,783,399	\$ 61,988,933	\$ 67,309,977	\$ 69,625,608	\$ 69,964,412	\$ 69,552,380	\$ 72,205,318
2. Actuarial Value of Assets (AVA)	32,477,527	33,601,537	33,871,180	35,186,072	37,521,424	39,290,072	41,015,087	44,381,706	50,012,149
3. Due (To)/From TDA ²	(250,030)	(322,818)	(304,649)	(363,493)	(464,899)	(486,005)	(488,763)	(303,249)	(327,585)
4. Unfunded Accrued Liability (UAL) (1. - 2. - 3.)	22,910,869	24,424,012	25,216,868	27,166,354	30,253,452	30,821,541	29,438,088	25,473,924	22,520,754
5. PV 1-year Adjusted Employer Contribution ³	2,386,846	1,055,636	1,034,859	1,037,450	1,015,997	1,050,590	1,088,218	3,760,325	3,598,373
6. PV Future Administrative Expense Reimbursement	0	71,988	71,326	71,999	76,284	89,600	100,403	52,624	50,954
7. Adjusted UAL (4. - 5. - 6.)	\$ 20,524,023	\$ 23,296,388	\$ 24,110,683	\$ 26,056,905	\$ 29,161,171	\$ 29,681,351	\$ 28,249,467	\$ 21,660,975	\$ 18,871,427

¹ Beginning at June 30, 2017, amounts remaining to be amortized have been reduced by the prior valuation year's amortization payments. When considered with (3) below, this change has no effect.

² Represents difference between TDA assets and actuarial present value of benefits for members who elect to annuitize their TDA account.

³ Beginning at June 30, 2017, the PV 1-year Adjusted Employer Contribution includes amounts used to pay UAL bases and one year of administrative expenses. When considered with (1) above, this change has no effect.

Table III-5
Actuarial and Statutory Contribution History

Table III-5 compares the Statutory Contributions to the Actuarial Contributions for Fiscal Years 2011 through 2020.

(\$ Thousands)			
Fiscal Year Ended June 30	Actuarial Contribution Certified	Statutory Contribution Contributed	Percentage of Actuarial Contribution Contributed
2011	\$2,468,973	\$2,468,973	100.0%
2012	2,673,078	2,673,078	100.0%
2013	2,855,640	2,855,640	100.0%
2014	2,998,694	2,998,694	100.0%
2015	3,270,007	3,270,007	100.0%
2016	3,702,569	3,702,569	100.0%
2017	3,888,399	3,888,399	100.0%
2018	3,889,710	3,889,710	100.0%
2019	3,696,686	3,696,686	100.0%
2020	3,590,801	3,590,801	100.0%

Table III-6
City Rates: Contributions as a Percentage of Salary

Table III-6 shows the City Rates defined to be the contributions as a percentage of salary for the Fiscal Years 2011 through 2020.

CITY RATES (\$ Thousands)			
Fiscal Year Ended June 30	Actuarial Contribution ¹	Salary ² at Beginning of Fiscal Year	City Rate
2011	\$2,468,973	\$7,935,195	31.1%
2012	2,673,078	7,920,820	33.7%
2013	2,855,640	7,833,398	36.5%
2014	2,998,694	7,964,149	37.7%
2015	3,270,007	8,074,522	40.5%
2016	3,702,569	8,256,100	44.8%
2017	3,888,399	8,818,537	44.1%
2018	3,889,710	9,200,180	42.3%
2019	3,722,186	9,874,119	37.7%
2020 ³	3,616,322	10,439,259	34.6%

¹ Starting in Fiscal Year 2019, reflects the estimate of the contribution made by the Department of Education to the Annuity Savings Accumulation Fund (ASAF).

² Includes the impact of recent labor contract settlements and certain non-union salary increases with retroactive effective dates, if any.

³ Actuarial Contribution is amount before offsetting for ASAF and Pre-Payment Credits.

SECTION IV - RESULTS BY CONTRIBUTING ENTITY

Table IV-1
Employer Contributions by Obligor

NEW YORK CITY TEACHERS' RETIREMENT SYSTEM							
EMPLOYER CONTRIBUTION BY OBLIGOR							
Valuation Date	June 30, 2018 (Lag)						
Fiscal Year	2020						
Obligor	Future Leaders	Harriet Tubman	Imagine Me Leadership	KIPP Academy	KIPP NYC	Opportunity	Renaissance
Contribution							
1. Normal Cost	\$ 302,918	\$ 432,760	\$ 110,399	\$ 586,737	\$ 618,907	\$ 598,841	\$ 773,930
2. Amortization of Unfunded Accrued Liability	109,881	99,694	13,385	(161,173)	80,391	187,665	779,808
3. Administrative Expenses	13,019	21,700	5,304	32,549	19,290	22,906	18,083
4. Actuarial Contribution (1. + 2. + 3.)	\$ 425,818	\$ 554,154	\$ 129,088	\$ 458,113	\$ 718,588	\$ 809,412	\$ 1,571,821
5. Statutory Contribution	\$ 425,818	\$ 554,154	\$ 129,088	\$ 458,113	\$ 718,588	\$ 809,412	\$ 1,571,821
Obligor	South Bronx Early College Academy	UFT	University Prep Charter HS	Voice	Wildcat		Charter School Subtotal
Contribution							
1. Normal Cost	\$ 257,835	\$ 338,298	\$ 486,199	\$ 412,009	\$ 420,473		\$ 5,339,306
2. Amortization of Unfunded Accrued Liability	33,172	382,287	280,024	55,967	165,444		2,026,545
3. Administrative Expenses	11,333	15,191	13,262	18,324	9,162		200,123
4. Actuarial Contribution (1. + 2. + 3.)	\$ 302,340	\$ 735,776	\$ 779,485	\$ 486,300	\$ 595,079		\$ 7,565,974
5. Statutory Contribution	\$ 302,340	\$ 735,776	\$ 779,485	\$ 486,300	\$ 595,079		\$ 7,565,974

Table IV-1
Employer Contributions by Obligor (cont'd)

NEW YORK CITY TEACHERS' RETIREMENT SYSTEM						
EMPLOYER CONTRIBUTION BY OBLIGOR						
Valuation Date	June 30, 2018 (Lag)					
Fiscal Year	2020					
Obligor	Charter School Subtotal	CUNY: Senior Colleges	CUNY: Community Colleges / Others	CUNY Subtotal	Department of Education	Total
Contribution						
1. Normal Cost	\$ 5,339,306	\$ 35,942,121	\$ 21,925,201	\$ 57,867,322	\$ 1,295,352,007	\$ 1,358,558,635
2. Amortization of Unfunded Accrued Liability	2,026,545	58,234,089	23,072,920	81,307,009	2,118,031,749	2,201,365,303
3. Administrative Expenses	200,123	1,679,820	942,020	2,621,840	53,575,810	56,397,773
4. ASAF Credit	0	0	0	0	(25,500,000)	(25,500,000)
5. DOE Pre-payment credit	0	0	0	0	(20,450)	(20,450)
6. Actuarial Contribution (1. + 2. + 3. + 4. + 5.)	\$ 7,565,974	\$ 95,856,030	\$ 45,940,141	\$ 141,796,171	\$ 3,441,439,116	\$ 3,590,801,261
7. Statutory Contribution	\$ 7,565,974	\$ 95,856,030	\$ 45,940,141	\$ 141,796,171	\$ 3,441,439,116	\$ 3,590,801,261

Table IV-2
Accrued Liabilities by Obligor

NEW YORK CITY TEACHERS' RETIREMENT SYSTEM							
ACCRUED LIABILITIES BY OBLIGOR							
Valuation Date	June 30, 2018 (Lag)						
Fiscal Year	2020						
Obligor	Future Leaders	Harriet Tubman	Imagine Me Leadership	KIPP Academy	KIPP NYC	Opportunity	Renaissance
Accrued Liability							
1. Active Members	\$ 2,745,212	\$ 5,007,361	\$ 304,911	\$ 5,653,439	\$ 9,127,645	\$ 6,602,682	\$ 14,711,603
2. Active Off Payroll Members ¹	92,063	279,433	0	614,239	673,854	193,571	598,732
3. Terminated Vested Members	543,222	1,020,546	0	1,809,103	1,134,616	1,393,371	537,167
4. Retirees and Beneficiaries	<u>1,652,581</u>	<u>270,596</u>	<u>0</u>	<u>571,465</u>	<u>0</u>	<u>1,869,428</u>	<u>4,875,244</u>
5. Accrued Liability Pre-Adjustments (1. to 4.)	\$ 5,033,078	\$ 6,577,936	\$ 304,911	\$ 8,648,246	\$ 10,936,115	\$ 10,059,052	\$ 20,722,746
6. Actuarial Adjustments ²	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
7. Total Accrued Liability (AL) (5. + 6.)	\$ 5,033,078	\$ 6,577,936	\$ 304,911	\$ 8,648,246	\$ 10,936,115	\$ 10,059,052	\$ 20,722,746
Present Value of Benefits							
1. Active Members	\$ 9,766,858	\$ 12,827,509	\$ 2,890,040	\$ 21,088,810	\$ 17,278,615	\$ 16,818,523	\$ 23,665,808
2. Active Off Payroll Members ¹	92,063	279,433	0	614,239	673,854	193,571	598,732
3. Terminated Vested Members	543,222	1,020,546	0	1,809,103	1,134,616	1,393,371	537,167
4. Retirees and Beneficiaries	<u>1,652,581</u>	<u>270,596</u>	<u>0</u>	<u>571,465</u>	<u>0</u>	<u>1,869,428</u>	<u>4,875,244</u>
5. Present Value of Benefits (1. to 4.)	\$ 12,054,724	\$ 14,398,084	\$ 2,890,040	\$ 24,083,617	\$ 19,087,085	\$ 20,274,893	\$ 29,676,951
6. Actuarial Adjustments ²	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
7. Total Present Value of Benefits (5. + 6.)	\$ 12,054,724	\$ 14,398,084	\$ 2,890,040	\$ 24,083,617	\$ 19,087,085	\$ 20,274,893	\$ 29,676,951
Obligor	South Bronx Early College Academy	UFT	University Prep Charter HS	Voice	Wildcat		Charter School Subtotal
Accrued Liability							
1. Active Members	\$ 1,521,200	\$ 5,166,524	\$ 6,892,847	\$ 3,500,431	\$ 7,067,282		\$ 68,301,137
2. Active Off Payroll Members ¹	128,251	281,725	5,169	85,821	178,147		3,131,005
3. Terminated Vested Members	0	2,452,914	651,860	64,344	275,752		9,882,895
4. Retirees and Beneficiaries	<u>0</u>	<u>2,370,279</u>	<u>606,135</u>	<u>0</u>	<u>922,892</u>		<u>13,138,620</u>
5. Accrued Liability Pre-Adjustments (1. to 4.)	\$ 1,649,451	\$ 10,271,442	\$ 8,156,011	\$ 3,650,596	\$ 8,444,073		\$ 94,453,657
6. Actuarial Adjustments ²	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>		<u>0</u>
7. Total Accrued Liability (AL) (5. + 6.)	\$ 1,649,451	\$ 10,271,442	\$ 8,156,011	\$ 3,650,596	\$ 8,444,073		\$ 94,453,657
Present Value of Benefits							
1. Active Members	\$ 7,333,013	\$ 10,200,536	\$ 15,593,464	\$ 14,497,093	\$ 11,029,522		\$ 162,989,791
2. Active Off Payroll Members ¹	128,251	281,725	5,169	85,821	178,147		3,131,005
3. Terminated Vested Members	0	2,452,914	651,860	64,344	275,752		9,882,895
4. Retirees and Beneficiaries	<u>0</u>	<u>2,370,279</u>	<u>606,135</u>	<u>0</u>	<u>922,892</u>		<u>13,138,620</u>
5. Present Value of Benefits (1. to 4.)	\$ 7,461,264	\$ 15,305,454	\$ 16,856,628	\$ 14,647,258	\$ 12,406,313		\$ 189,142,311
6. Actuarial Adjustments ²	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>		<u>0</u>
7. Total Present Value of Benefits (5. + 6.)	\$ 7,461,264	\$ 15,305,454	\$ 16,856,628	\$ 14,647,258	\$ 12,406,313		\$ 189,142,311

¹ Represents members no longer on payroll, but not otherwise classified.

² Includes actuarial loading adjustments.

Table IV-2
Accrued Liabilities by Obligor (cont'd)

NEW YORK CITY TEACHERS' RETIREMENT SYSTEM						
ACCRUED LIABILITIES BY OBLIGOR						
Valuation Date	June 30, 2018 (Lag)					
Fiscal Year	2020					
Obligor	Charter School Subtotal	CUNY: Senior Colleges	CUNY: Community Colleges / Others	CUNY Subtotal	Department of Education	Total
Accrued Liability						
1. Active Members	\$ 68,301,137	\$ 503,470,881	\$ 254,559,901	\$ 758,030,782	\$ 26,271,176,483	\$ 27,097,508,402
2. Active Off Payroll Members ¹	3,131,005	39,578,516	30,274,261	69,852,777	483,540,175	556,523,957
3. Terminated Vested Members	9,882,895	23,874,730	10,933,142	34,807,872	1,349,730,078	1,394,420,845
4. Retirees and Beneficiaries	<u>13,138,620</u>	<u>995,524,821</u>	<u>323,017,999</u>	<u>1,318,542,820</u>	<u>41,819,183,757</u>	<u>43,150,865,197</u>
5. Accrued Liability Pre-Adjustments (1. to 4.)	\$ 94,453,657	\$ 1,562,448,948	\$ 618,785,303	\$ 2,181,234,251	\$ 69,923,630,493	\$ 72,199,318,401
6. Actuarial Adjustments ²	<u>0</u>	<u>103,398</u>	<u>42,002</u>	<u>145,400</u>	<u>5,854,600</u>	<u>6,000,000</u>
7. Total Accrued Liability (AL) (5. + 6.)	\$ 94,453,657	\$ 1,562,552,346	\$ 618,827,305	\$ 2,181,379,651	\$ 69,929,485,093	\$ 72,205,318,401
Present Value of Benefits						
1. Active Members	\$ 162,989,791	\$ 884,960,704	\$ 512,591,611	\$ 1,397,552,315	\$ 42,996,750,647	\$ 44,557,292,753
2. Active Off Payroll Members ¹	3,131,005	39,578,516	30,274,261	69,852,777	483,540,175	556,523,957
3. Terminated Vested Members	9,882,895	23,874,730	10,933,142	34,807,872	1,349,730,078	1,394,420,845
4. Retirees and Beneficiaries	<u>13,138,620</u>	<u>995,524,821</u>	<u>323,017,999</u>	<u>1,318,542,820</u>	<u>41,819,183,757</u>	<u>43,150,865,197</u>
5. Present Value of Benefits (1. to 4.)	\$ 189,142,311	\$ 1,943,938,771	\$ 876,817,013	\$ 2,820,755,784	\$ 86,649,204,657	\$ 89,659,102,752
6. Actuarial Adjustments ²	<u>0</u>	<u>103,398</u>	<u>42,002</u>	<u>145,400</u>	<u>5,854,600</u>	<u>6,000,000</u>
7. Total Present Value of Benefits (5. + 6.)	\$ 189,142,311	\$ 1,944,042,169	\$ 876,859,015	\$ 2,820,901,184	\$ 86,655,059,257	\$ 89,665,102,752

¹ Represents members no longer on payroll, but not otherwise classified.

² Includes actuarial loading adjustments.

Table IV-3
Participant Data by Obligor

NEW YORK CITY TEACHERS' RETIREMENT SYSTEM							
PARTICIPANT DATA BY OBLIGOR							
Valuation Date	June 30, 2018 (Lag)						
Fiscal Year	2020						
Obligor	Future Leaders	Harriet Tubman	Imagine Me Leadership	KIPP Academy	KIPP NYC	Opportunity	Renaissance
Participant Data							
1. Active Members							
a. Number	39	64	22	83	38	61	58
b. Annual Salary ¹	\$ 2,971,149	\$ 3,999,471	\$ 1,291,419	\$ 6,876,386	\$ 3,976,627	\$ 5,247,222	\$ 5,381,860
c. Average Salary	\$ 76,183	\$ 62,492	\$ 58,701	\$ 82,848	\$ 104,648	\$ 86,020	\$ 92,791
2. Active Off Payroll Members ²	5	18	0	17	9	14	4
3. Terminated Vested Members	8	7	0	34	33	17	4
4. Retirees and Beneficiaries							
a. Number	2	1	0	1	0	3	9
b. Total Annual Benefits	\$ 146,170	\$ 24,587	\$ 0	\$ 56,463	\$ 0	\$ 156,073	\$ 415,295
c. Average Annual Benefit	\$ 73,085	\$ 24,587	\$ 0	\$ 56,463	\$ 0	\$ 52,024	\$ 46,144
Obligor	South Bronx Early College Academy	UFT	University Prep Charter HS	Voice	Wildcat	Charter School Subtotal	
Participant Data							
1. Active Members							
a. Number	40	28	45	63	28		569
b. Annual Salary ¹	\$ 2,820,798	\$ 2,494,174	\$ 4,251,542	\$ 4,800,962	\$ 2,761,958		\$ 46,873,568
c. Average Salary	\$ 70,520	\$ 89,078	\$ 94,479	\$ 76,206	\$ 98,641		\$ 82,379
2. Active Off Payroll Members ²	7	5	1	9	5		94
3. Terminated Vested Members	0	27	8	4	3		145
4. Retirees and Beneficiaries							
a. Number	0	3	1	0	2		22
b. Total Annual Benefits	\$ 0	\$ 179,593	\$ 48,400	\$ 0	\$ 76,179		\$ 1,102,760
c. Average Annual Benefit	\$ 0	\$ 59,864	\$ 48,400	\$ 0	\$ 38,090		\$ 50,125

¹ Salaries shown reflect the impact of recent labor contract settlements and certain non-union salary increases with retroactive effective dates, if any.

² Represents members no longer on payroll, but not otherwise classified.

Table IV-3
Participant Data by Obligor (cont'd)

NEW YORK CITY TEACHERS' RETIREMENT SYSTEM						
PARTICIPANT DATA BY OBLIGOR						
Valuation Date	June 30, 2018 (Lag)					
Fiscal Year	2020					
Obligor	Charter School Subtotal	CUNY: Senior Colleges	CUNY: Community Colleges / Others	CUNY Subtotal	Department of Education	Total
Participant Data						
1. Active Members						
a. Number	569	3,819	2,164	5,983	115,212	121,764
b. Annual Salary ¹	\$ 46,873,568	\$ 249,969,023	\$ 156,076,783	\$ 406,045,806	\$ 9,951,484,310	\$ 10,404,403,684
c. Average Salary	\$ 82,379	\$ 65,454	\$ 72,124	\$ 67,867	\$ 86,375	\$ 85,447
2. Active Off Payroll Members ²	94	951	932	1,883	7,439	9,416
3. Terminated Vested Members	145	235	123	358	15,930	16,433
4. Retirees and Beneficiaries						
a. Number	22	1,962	688	2,650	83,623	86,295
b. Total Annual Benefits	\$ 1,102,760	\$ 121,987,320	\$ 35,183,169	\$ 157,170,489	\$ 4,076,003,669	\$ 4,234,276,918
c. Average Annual Benefit	\$ 50,125	\$ 62,175	\$ 51,138	\$ 59,310	\$ 48,743	\$ 49,067

¹ Salaries shown reflect the impact of recent labor contract settlements and certain non-union salary increases with retroactive effective dates, if any.

² Represents members no longer on payroll, but not otherwise classified.

SECTION V - (GAIN)/LOSS ANALYSIS

Table V-1
Development of Experience (Gain)/Loss

Table V-1 develops the asset and liability (Gain)/Loss between the June 30, 2017 (Lag) actuarial valuation and the June 30, 2018 (Lag) actuarial valuation.

DEVELOPMENT OF EXPERIENCE (GAIN) / LOSS		
June 30, 2018		
(\$ Thousands)		
1.	Expected Accrued Liability (AL)	
	a. AL at June 30, 2017	\$ 69,552,380
	b. Total Normal Cost and Administrative Expenses at June 30, 2017	1,473,778
	c. Interest on 1.a. and 1.b. to June 30, 2018	4,971,831
	d. Fiscal Year 2018 Benefit Payments	(4,351,924)
	e. Interest on 1.d. to June 30, 2018	<u>(149,741)</u>
	f. Expected AL at June 30, 2018	\$ 71,496,324
2.	Actual AL at June 30, 2018	\$ 72,205,318
3.	Expected Total Actuarial Value of Assets (AVA) ¹	
	a. Total AVA at June 30, 2017	\$ 44,078,457
	b. Interest on 3.a. to June 30, 2018	3,085,492
	c. Total Contributions Paid in Fiscal Year 2018	4,144,930
	d. Interest on 3.c. to June 30, 2018	142,619
	e. Fiscal Year 2018 Benefit Payments	(4,351,924)
	f. Interest on 3.e. to June 30, 2018	<u>(149,741)</u>
	g. Expected Total at June 30, 2018	\$ 46,949,833
4.	Actual Total AVA at June 30, 2018 (before Method Change) ²	\$ 48,280,956
5.	Accrued Liability (Gain) / Loss (2. - 1.f.)	\$ 708,994
6.	Actuarial Asset (Gain) / Loss (3.g. - 4.)	\$ (1,331,123)
7.	Total Actuarial (Gain) / Loss (5. + 6.)	\$ (622,129)

¹ Includes amount due from TDA of \$(303,249,000).

² Includes amount due from TDA of \$(327,585,000).

SECTION VI – SCHEDULE OF FUNDING PROGRESS

A schedule of funding progress is provided below. This schedule of funding progress was previously required by GASB25, which has been superseded by GASB67, and is provided for historical context. These liability and asset measures are used to develop the Actuarial Contribution and are not suitable for other purposes including, but not limited to, settlement of plan obligations. For more information, see SECTION II – MARKET AND ACTUARIAL VALUES OF ASSETS.

Table VI-1
Schedule of Funding Progress

NEW YORK CITY TEACHERS' RETIREMENT SYSTEM (\$ Thousands)						
June 30 (Lag) Valuation Date	(1) Actuarial Value of Assets (AVA)	(2) Accrued Liability (AL)	(3) Unfunded AL (UAL) (2) - (1)	(4) Funded Ratio (1) / (2)	(5) Covered Payroll	(6) UAL as a % of Covered Payroll (3) / (5)
2009	\$30,774,981	\$47,988,459	\$17,213,478	64.1%	\$8,016,636	214.7%
2010	32,477,527	55,138,366	22,660,839	58.9%	7,979,671	284.0%
2011	33,601,537	57,702,731	24,101,194	58.2%	7,888,204	305.5%
2012	33,871,180	58,783,399	24,912,219	57.6%	8,013,395	310.9%
2013	35,186,072	61,988,933	26,802,861	56.8%	8,128,378	329.7%
2014	37,521,424	67,309,977	29,788,553	55.7%	8,274,686	360.0%
2015	39,290,072	69,625,608	30,335,536	56.4%	8,844,651	343.0%
2016	41,015,087	69,964,412	28,949,325	58.6%	9,224,268	313.8%
2017	44,381,706	69,552,380	25,170,674	63.8%	9,848,899	255.6%
2018	50,012,149	72,205,318	22,193,169	69.3%	10,404,404	213.3%

Effective June 30, 2010, AL is based on the Entry Age Normal cost method. Previously, the Frozen Initial Liability cost method was used. Salaries reflect the impact of recent labor contract settlements and certain non-union salary increases with retroactive effective dates, if any.

SECTION VII - RISK AND UNCERTAINTY

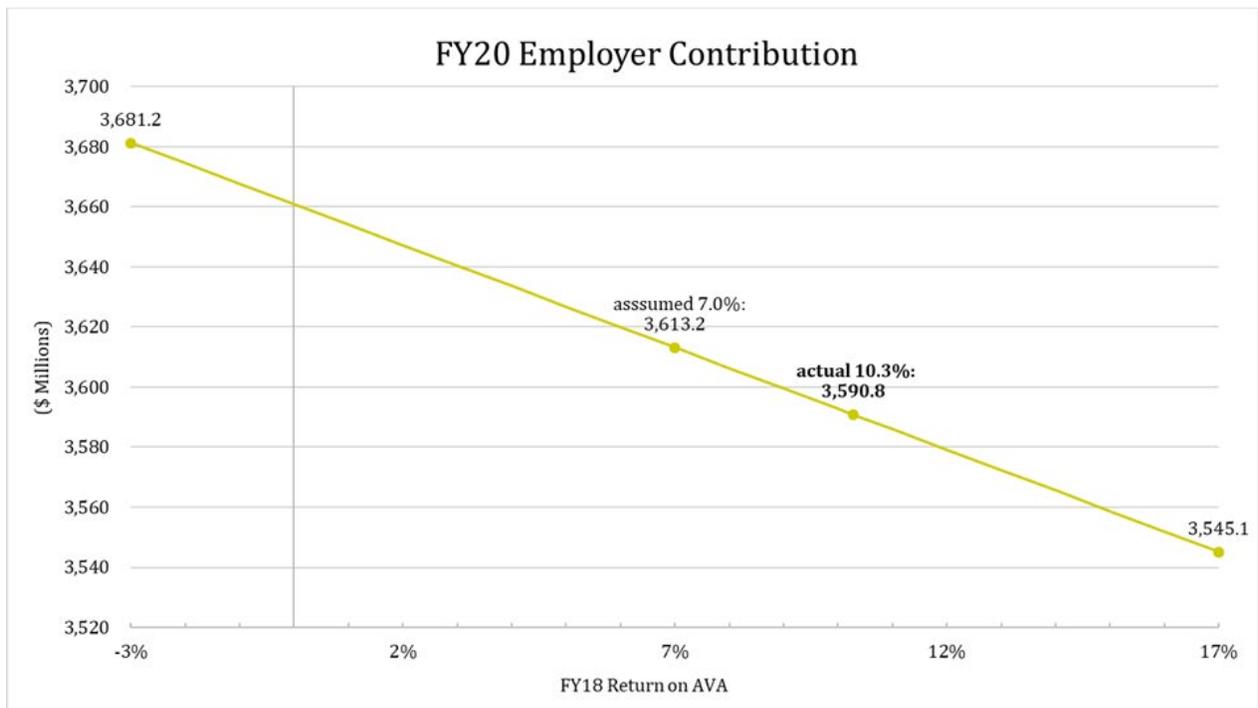
The funded status of TRS depends highly on the realization of the actuarial assumptions used, as well as certain demographic characteristics of the Plan and other exogenous factors. Risks faced by the Plan are described in this Section. These risks have been separated, based on the Actuary's professional judgement, into high, medium, and other risks.

High Risk Types

Investment Risk: The Risk of Not Realizing Expected Returns

The most substantial risk for most pension systems, TRS included, is the risk of investment returns being less than assumed. Generally speaking, as risk-free investment return rates have fallen in recent decades, more aggressive asset allocations have been taken to achieve long-term rates of return commensurate with the actuarial assumption of 7.0%.

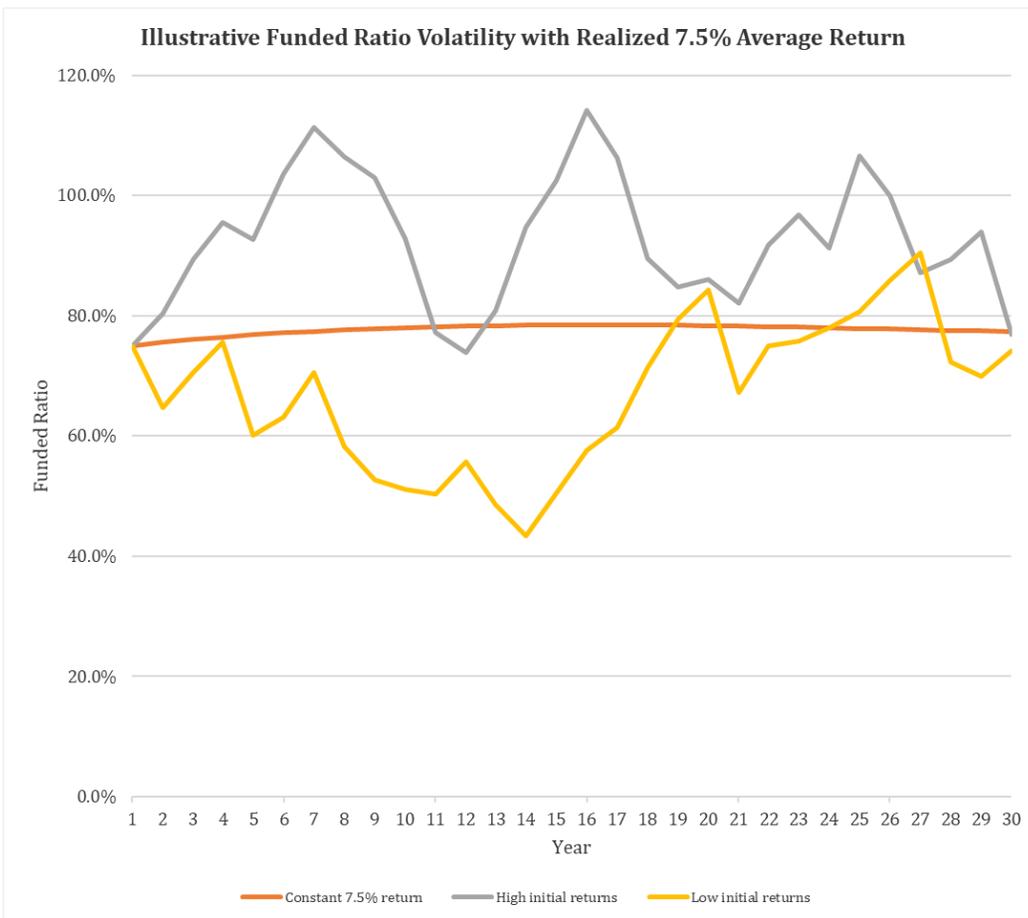
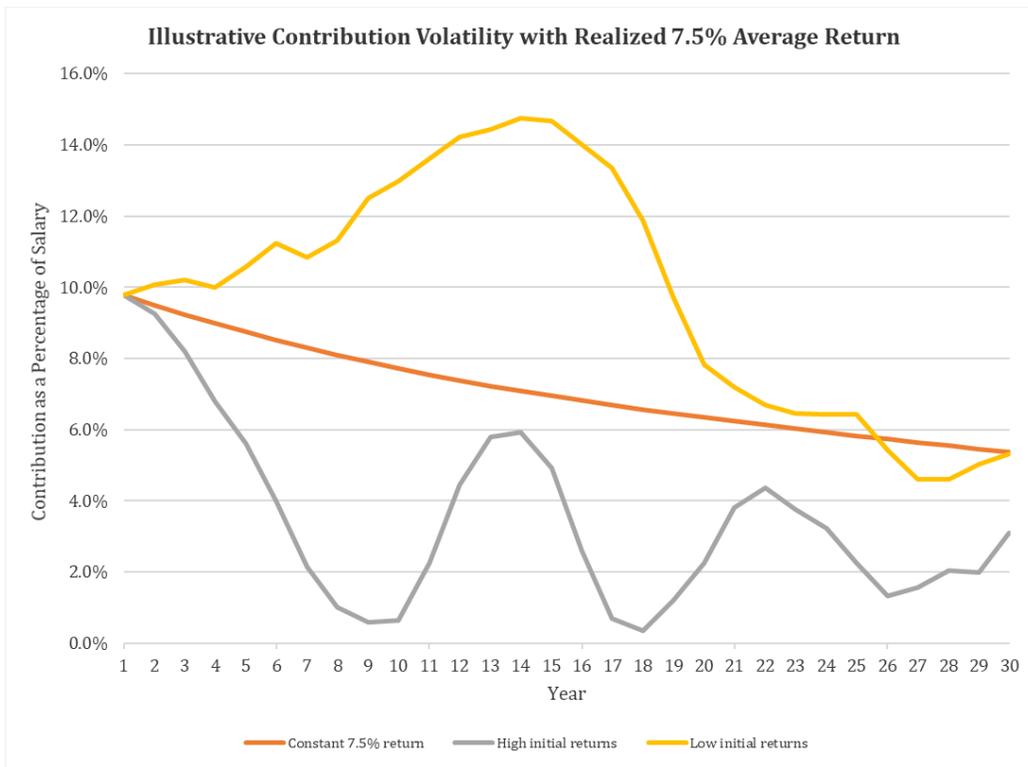
The graph below illustrates the potential FY20 employer contributions if the FY18 investment return had differed from the actual rate, by up to 10%.



Investment Risk: The Risk of Volatile Realized Returns

Even when long-term investment returns meet actuarial assumptions, investment return volatility can contribute substantially to contribution and funded status volatility. While not yet available specifically for the Plan at this time, recent research demonstrates this volatility based on a sample public plan with typical characteristics, a typical contribution policy, and a long-term return assumption of 7.5%, which can be realized in different patterns.¹

¹ Yin, Yimeng; Boyd, Don. Pension Simulation Project. *The Nelson A. Rockefeller Institute of Government*.

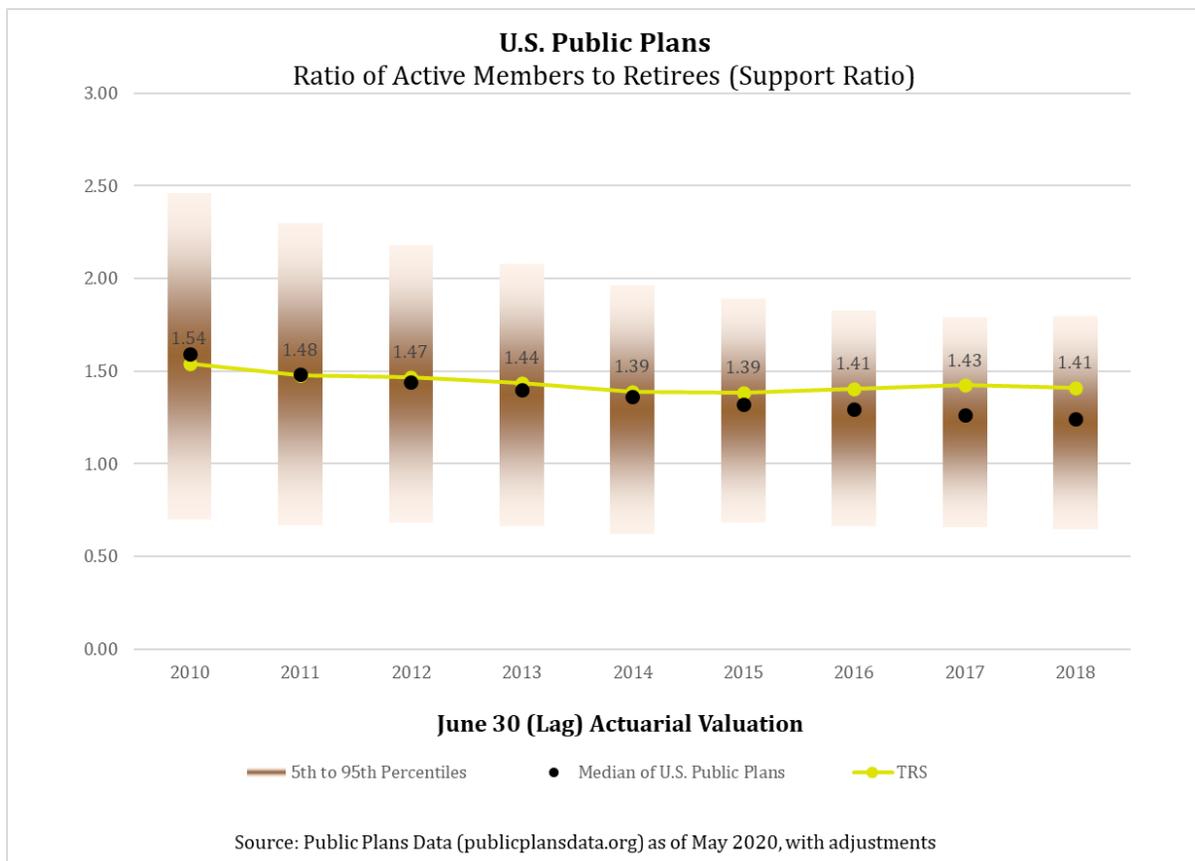


Maturity Risk: The Risk of Demographic Imbalance

In this subsection, the maturity of the Plan is examined with several metrics.

Ratio of Active Members to Retirees (Support Ratio)

A plan's Support Ratio (i.e. the ratio of active members to retirees) is an indicator of the Plan's maturity level. In a plan's early years, the ratio is very high as the plan contains mostly active members. As it matures, more active members transition to retirement, leading to a decrease in the Support Ratio over time that can result in a ratio near or below one. For TRS, this ratio has remained relatively stable in recent years, meaning that about the same number of active workers exist to support pensioner payments.

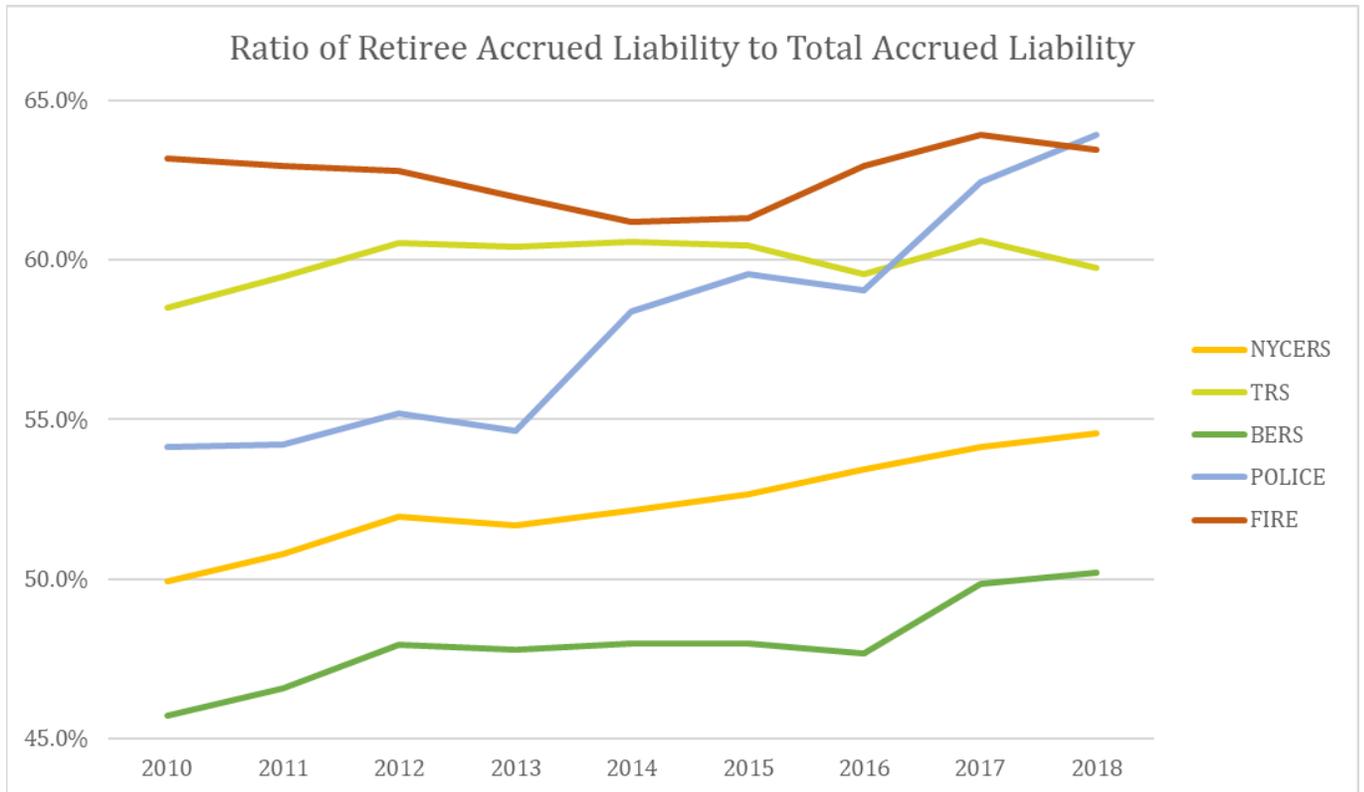


The chart above shows U.S. public pension plan Support Ratios in comparison to the Plan's. The median Support Ratio amongst U.S. public pensions has declined from 1.59 in the 2010 valuation year to 1.24 in the 2018 valuation year. Over that same period, the Plan's Support Ratio declined from 1.54 to 1.41, meaning that fewer active workers exist to support guaranteed pensioner payments.

Because the Plan's Support Ratio is above the median in recent years, TRS' contributions for active members form a larger proportion of the total actuarial contribution than other pension funds in the U.S. with average maturity.

Ratio of Retiree Accrued Liability to Total Accrued Liability

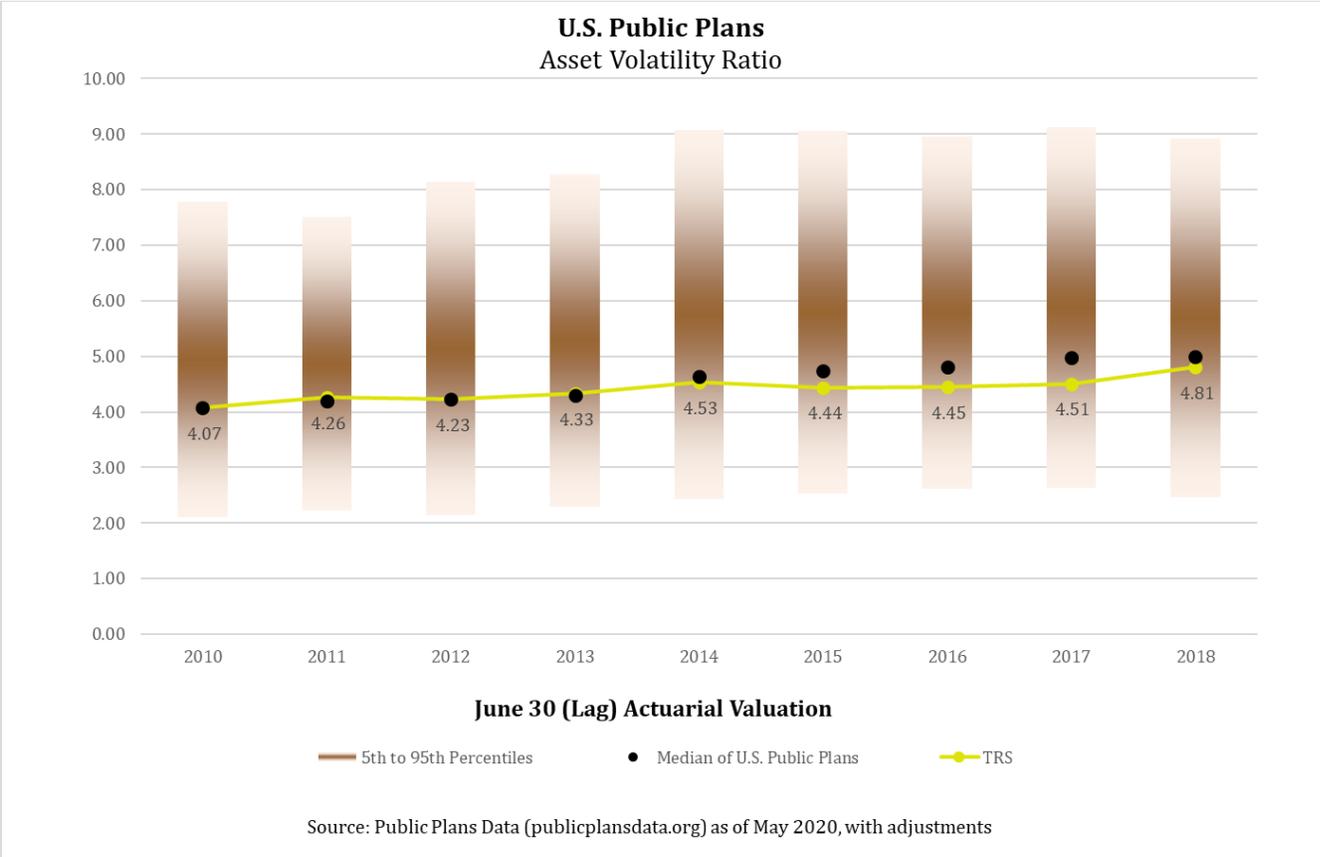
We can also consider the ratio of the Plan’s retiree liability to its total liability. A new pension plan begins with this ratio at zero; as the plan matures, the ratio increases. Mature plans often have ratios above 60%. This measure is shown in the graph below for TRS; the other New York City Retirement Systems¹ are included for comparison purposes. The ratio for TRS has been between 60-62% for the past few years, indicating that TRS is becoming a mature retirement system.



Asset Volatility Ratio

Another way to look at plan maturity is the Asset Volatility Ratio (AVR), or ratio of assets to payroll. This ratio tends to rise as plans mature because assets generally need to accumulate to provide for benefit payments. The chart below compares the AVR (on an AVA basis) for TRS to the population of public pension systems.

¹ New York City Employees’ Retirement System (NYCERS); Board of Education Retirement System (BERS); Police Pension Fund (POLICE); Fire Pension Fund (FIRE)



As a plan approaches maturity, AVRs tend to increase, and the plan’s actuarially-determined contribution becomes more sensitive to investment losses. For example, the same percentage of investment losses in more mature plans with a larger asset base can increase contributions as a percentage of payroll more than in less mature plans, leading to additional volatility. Therefore, mature plans may wish to consider more conservative investment strategies. Typical AVRs for a mature retirement system are between 5 and 6. As shown in the tables above, for TRS, these ratios are close to the average.

Medium Risk Types

Interest Rate Risk: The Risk of Reduction in the Long-Term Rate of Return

The Accrued Liability for the Plan depends heavily on the actuarial assumption used for future investment returns. While the returns themselves can produce substantial volatility, as detailed in the Investment Risk subsection above, the long-term rate of return assumption of 7.0% is highly dependent on the allocation of Plan assets.

If market conditions or the allocation of Plan assets no longer support a long-term rate of return assumption of 7.0%, the Actuarial Interest Rate (AIR) may have to be reduced, which can significantly increase the Accrued Liability, Unfunded Accrued Liability, Normal Cost, and resulting contribution of the Plan. The sensitivity of the Accrued Liability, the Unfunded Accrued Liability, Funded Ratio, and Normal Cost of the Plan are shown below:

NEW YORK CITY TEACHERS' RETIREMENT SYSTEM	
SENSITIVITY ANALYSIS AS OF JUNE 30, 2018	
Valuation Date	June 30, 2018
Results at 7.0%	
1. Accrued Liability	\$ 72,205,318,401
2. Actuarial Value of Assets (AVA)	<u>50,012,149,000</u>
3. Unfunded Accrued Liability (AVA Basis) (1.-2.)	22,193,169,401
4. Funded Ratio (2./1.)	69.3%
5. Normal Cost	1,358,558,635
Results at 6.0%	
1. Accrued Liability	\$ 80,191,921,987
2. Actuarial Value of Assets (AVA)	<u>50,012,149,000</u>
3. Unfunded Accrued Liability (AVA Basis) (1.-2.)	30,179,772,987
4. Funded Ratio (2./1.)	62.4%
5. Normal Cost	2,073,293,414
Sensitivity Analysis for 1.0% Reduction in Interest Rate	
1. Increase in Accrued Liability	11.1%
2. Increase in Unfunded Accrued Liability (AVA Basis)	36.0%
3. Decrease in Funded Ratio	6.9%
4. Increase in Normal Cost	52.6%

Longevity Risk: The Risk of Higher than Assumed Mortality Improvement

TRS faces risk in its assumption of future mortality rates. Actuarial experience studies were used to develop the base mortality rates assumed in the valuation; Society of Actuaries mortality improvement scale MP-2018 was subsequently applied to these base rates.¹

This scale MP-2018 is an assumption regarding the *improvement* of future mortality rates as compared to mortality when the experience studies were completed. The scale was developed using large amounts of historical data from the Social Security Administration. Risk therefore exists that the mortality improvement inherent in the Plan population is higher than the improvement seen in the population provided by the Social Security Administration. When mortality improvement is higher than assumed, plan participants will live longer than expected, and the plan will pay more pension benefits than had been previously funded.

Furthermore, while the scale uses recent experience to develop short-term mortality improvement rates, an actuarial assumption is applied to long-term mortality improvement rates based on expert opinion. A rate of 1.0% is assumed, which the Society of Actuaries characterizes as “neither overly optimistic nor too pessimistic with respect to future longevity improvements.”² Risk to the Plan exists, however, if Plan mortality experience shows higher levels of long-term mortality improvement; expert opinion can in some cases be flawed, particularly when past experience is not indicative or predictive of future experience.

In a letter dated June 28, 2019, Buck analyzed historical Plan experience and noted “it appears that historical mortality improvement in NYC pensioners has kept pace with, and in some cases may have exceeded slightly, the mortality improvement trends in historical Social Security Administration graduated rates that are based on a broad U.S. population” and that “continued use of MP-20xx mortality improvement scales seems reasonable.” It may be prudent in future years, after longer trends can be observed, to quantify the effect of changing the ultimate mortality improvement rate to be higher than 1.0%.

Litigation Risk: The Risk of Legal Claims and Lawsuits

It is not uncommon for New York City to be a defendant in legal claims and lawsuits.³ In its most recent claims report, the Comptroller reports that in FY2018, NYC settled 14,094 claims and lawsuits for \$1.0 billion. On occasion, these settlements involve NYCERS. The 1996 case *Gulino v. Board of Education* awards damages to plaintiffs that in some cases include counterfactual service and salary in NYCERS. It remains a continuing risk that litigation may expand the scope of pension benefits beyond what is intended or codified in statute.

¹ Retirement Plans Experience Committee. “Mortality Improvement Scale MP-2018 Report” and “Mortality Improvement Scale MP-2014 report.” *Society of Actuaries*.

² Retirement Plans Experience Committee. “Mortality Improvement Scale BB Report” 5.5 Selection of 1.0% Long-Term Rate of Mortality Improvement. *Society of Actuaries*.

³ <https://comptroller.nyc.gov/wp-content/uploads/documents/Claims-Report-FY-2018.pdf>

Other Risk Types

Credit/Solvency Risk: The Risk of Potential Insolvency of Contributing Entities

All public pension systems face credit risk in the event their sponsoring entities become unable to pay their debts and obligations. Credit rating agencies currently consider New York City bonds to be of high quality, and the Actuary believes the City faces low credit risk as a main contributing entity to TRS.

In addition, TRS is a multiple-employer plan with several contributing entities. TRS faces risk if contributing entities become insolvent while still carrying Unfunded Accrued Liability. Existing law and precedent transfer these amounts to other employers, creating imbalanced funding responsibility in the event of default. For example, in the final June 30, 2016 (Lag) actuarial valuation for FY18, the Department of Education assumed responsibility for unfunded liabilities associated with the Beginning with Children Charter School, which closed in 2016.

Inflation Risk: The Risk of Higher than Assumed Inflation

TRS faces risk if inflation is higher than expected. Inflation is a key driver of the salary increase assumptions (affecting active members) and COLA assumptions (affecting both active members and pensioners/beneficiaries). A quantitative analysis is not available at this time. Notably, however, the pensioner COLA is limited to half of CPI on the first \$18,000 of annual benefits, which limits the risk exposure to inflation.

Contribution Risk: The Risk that Future Contributions Are Less Than the Actuarially-Determined Contributions

Public pension systems can suffer from contribution risk when sponsoring governmental entities fail to make contributions as determined by the actuary under their funding policies. A 2018 study¹ which used data from 50 states and 230 retirement systems, found that since 2007 the shortfall between actual contributions to state pension plans and minimum actuarial funding standards was \$200 billion.²

The New York City Retirement Systems and Pension Funds face low contribution risk. City benefits are constitutionally protected, and participating employers have historically contributed to the actuarial contribution as certified by the Actuary. The Actuary believes the City will continue to do so in future years. See Table III-5 ACTUARIAL AND STATUTORY CONTRIBUTION HISTORY.

Contribution risk may also increase in future years if the actuarial contribution determined for the Plan grows to be a larger part of the City budget. The five New York City Retirement Systems and Pension Funds currently require contributions of over 10% of the City's annual budget, and contribution risk may increase if this contribution rate becomes untenable.

¹ The Pew Charitable Trusts. *"The State Pension Funding Gap: 2018."*

² Accounting standards changed in 2014. From 2007 to 2013, the shortfall is calculated between the actuarial recommended contribution and actual employer contributions. From 2014 to 2018, the shortfall represents the gap between the net amortization benchmark and employer contributions.

Agency/Political Risk: The Risk of Stakeholder Influences

With assumed long-term asset returns and gradual amortization of unfunded liabilities, the funded status of the Plan is expected to improve over time. Many public pension systems suffer from agency risk, wherein different stakeholders or agents want to influence the cost calculations in directions favorable to their interests. Agents may also downplay other risks (e.g. investment risk) to advance specific agendas. These situations create cases where promises for future funding can be disregarded for political expediency or other priorities. In other cases, certain plan provisions or administrative practices intended to provide occasional clarity or relief become commonplace or intentionally sought for the benefit of members at the expense of taxpayers.

Intergenerational Equity Risk: The Risk of Inequity in the Actuarially-Determined Contributions

Intergenerational inequity could exist for certain stakeholders (e.g. public taxpayers). If, for example, liabilities are valued using overly conservative assumptions, aggressive funding patterns may occur, thus causing current taxpayers to shoulder a disproportionately high share of the funding burden, as compared to past and future taxpayers. The reverse can also be true if aggressive or unrealistic assumptions are used. As the Plan is ongoing, taxpayers across all generations should be expected to offer similar funding contributions over the lifetime of the Plan.

Additionally, in future years of higher or lower funded status, changes in the statute may take place that can improve or diminish plan provisions. If so, intergenerational equity risk could increase as taxpayers and plan members at that time may receive preferential or less preferential treatment over the taxpayers and plan members prior to and subsequent to them.

SECTION VIII - SUMMARY OF PLAN PROVISIONS

A. Covered Employment

Membership in TRS is open to eligible teachers and administrative personnel employed by the Department of Education and certain employees of New York City Charter Schools and the City University of New York. Membership in TRS may be voluntary or mandated.

B. Tier Membership

Tier membership is based on the date that the member joined TRS. The tier status of earlier membership in TRS or another New York City or New York State public employee retirement system is reflected, but only if the service associated with that membership is purchased and included in Credited Service.

Tier 1: Prior to July 1, 1973

Tier 2: July 1, 1973 through July 26, 1976

Tier 4: July 27, 1976 through March 31, 2012

Tier 6: April 1, 2012

Tier 4 members who joined TRS before September 1, 1983 may elect a Tier 3 benefit. Unless otherwise noted, Tier 1 and Tier 2 provisions are hereafter omitted for brevity.¹ For more information about plan provisions, see the applicable Summary Plan Descriptions at www.trsnyc.org. In the event of a conflict between this summary and applicable law, the applicable laws will govern.

C. Basic Member Contributions (BMC)

Basic Member Contributions earn 5% interest per year, compounded annually.

Tier 4: The contribution rate is 3% of Salary. Tier 4 members contribute BMC for the first 10 years of Credited Service except members of the Chapter 504 55/27 plan contribute BMC for the first 27 years of Credited Service.

¹ Less than 0.3% of active members as of June 30, 2018 are members of Tier 1 and Tier 2.

Tier 6: BMC are made for all years of Credited Service according to the following schedule:

Lookback Wages	BMC Contribution Rate
Less than \$45,000	3.00%
\$45,001 up to \$55,000	3.50%
\$55,001 up to \$75,000	4.50%
\$75,001 up to \$100,000	5.75%
Greater than \$100,000	6.00%

The lookback wages used for determining the Tier 6 BMC contribution rate for a plan year are the actual wages earned two plan years prior to the plan year. A projected salary is used during the first 3 years of Credited Service. The BMC contribution rate was limited to 3% from April 1, 2012 through March 31, 2013.

D. Additional Member Contributions (AMC)

Additional Member Contributions earn 5% interest per year, compounded annually.

Tier 4: Members of the Basic 62/5 plan do not make AMC. For other Tier 4 members, the AMC contribution rate is 1.85% of Salary and are made in accordance with the following schedule:

Plan Description	AMC Contribution Rate	Years Required
Chapter 19 55/25	1.85%	25
Chapter 19 55/27	1.85%	27
Chapter 504 55/27 plan	1.85%	All years

Tier 6: Members of the 63/10 plan do not make AMC.

E. Credited Service

Credited Service is comprised of Membership Service, Part-time Service, Prior Service, Amman Service, Transferred Service, and Military Service:

- **Membership Service:** Service earned while a member of TRS.
- **Part-time Service:** Service that is prorated based on the number of hours or days worked in the year.
- **Prior Service:** Any creditable service earned as an employee of New York City or New York State before joining TRS that was not transferred to TRS.
- **Amman Service:** Creditable service earned as a regular substitute teacher and/or for per diem employment during a leave of absence or after separating from service.

- **Transferred Service:** Service earned as a member of another public retirement system in the City or State of New York.
- **Military Service:** Service for qualified time served in one of the armed forces of the United States.

Prior Service, Amman Service, Transferred Service, and Military Service must be purchased to count as Credited Service. Payments made for purchasing Military Service are considered Employer contributions.

F. Salary

Salary is based on the annual wages earned in covered employment including overtime pay. Some limitations apply for the Salary used to determine Final Average Salary (FAS).

Tier 4: Wages greater than 110% of the average of the previous two years are excluded for purposes of determining FAS.

Tier 6: Wages greater than 110% of the average of the previous four years are excluded for purposes of determining FAS. In addition, the following payments are also excluded from wages for purposes of determining FAS:

1. Wages greater than the annual salary paid to the Governor of the State of New York;
2. Lump sum payments for deferred compensation, sick leave, accumulated vacation or other credits for time not worked;
3. Overtime greater than the overtime ceiling of \$15,000, effective April 1, 2012 and indexed annually by the Consumer Price Index (CPI-U);
4. Any form of termination pay;
5. Any additional compensation paid in anticipation of retirement; and
6. In the case of employees who receive wages from three or more employers in a twelve-month period, the wages paid by the third and each successive employer.

G. Final Average Salary (FAS)

Service retirement, early retirement, disability retirement, and vested retirement benefits are based on Final Average Salary (FAS).

Tier 4: FAS is the highest average Salary earned in any three consecutive years of Credited Service or in the final 36 months of Credited Service if greater.

Tier 6: FAS is the highest average Salary earned in any five consecutive years of Credited Service or in the final 60 months of Credited Service if greater.

H. Service Retirement

1. Eligibility: The eligibility requirements for an unreduced service retirement benefit are summarized in the table below:

Tier	Plan Description	Minimum Age	Minimum Service
4	Basic 62/5 Plan	Earlier of Age 55 with 30 years of Service And Age 62 with 5 years of Service	
4	Chapter 19 55/25	55	25
4	Chapter 19 55/27	55	27
4	Chapter 504 55/27 plan	55	27
6	Basic 63/10 Plan	63	10

2. Benefits:

- a. Tier 4 Plans:

- i. Less than 20 years of Credited Service: 1/60 times FAS times Credited Service;
- ii. 20 or more years of Credited Service: Sum of 2.0% times FAS times Credited Service up to 30 years plus 1.5% times FAS times Credited Service in excess of 30 years.

- b. Basic Tier 6 63/10 Plan:

- i. 20 years of Credited Service: 1/60 times FAS times Credited Service;
- ii. 20 or more years of Credited Service: Sum of 35% times FAS plus 2.0% times FAS times Credited Service in excess of 20 years.

- c. Annuity Savings Accumulation Fund (ASAF):

- i. Annuitized value of the ASAF balance, if any, is added to the benefit.

I. Early Retirement

1. Eligibility: The eligibility requirements for early retirement plans are summarized in the table below:

Tier	Plan Description	Minimum Age	Minimum Service
4	All Tier 4 plans except the Chapter 504 55/27 plan	55	5
4	Chapter 504 55/27	55	10
6	Basic 63/10 plan	55	10

2. Benefits:

The service retirement benefit is reduced for early retirement based on the age at commencement.

a. Tier 4 Basic 62/5 Plan:

The service retirement benefit is reduced by 0.50% for each of the first 24 months that the age at commencement precedes age 62, and reduced 0.25% for each of the next 60 months that the age of commencement precedes age 60:

Age	Early Retirement Factor
61	0.94
60	0.88
59	0.85
58	0.82
57	0.79
56	0.76
55	0.73

Tier 4 members with Tier 3 rights may elect early retirement based on the provisions of the Tier 3 Basic 62/5 Plan.

b. Tier 6 Basic 63/10 Plan:

The service retirement benefit is reduced by 13/2400 for each month (i.e. 6.5% per year) that the age of commencement precedes age 63.

c. Annuity Savings Accumulation Fund (ASAF):

The annuitized value of the ASAF balance, if any, is added to the benefit.

J. Disability Retirement

1. Accidental Disability (ADR)

- a. Eligibility: No age or service requirement. Requires Medical Board determination that the active member is physically or mentally incapacitated due to an accident in the performance of duties and that the accident is not due to willful negligence of the member.
- b. Benefits: Greater of $1/60$ times FAS times Credited Service or $2/3$ times FAS. The member may elect a service retirement benefit, if eligible.

2. Ordinary Disability (ODR)

- a. Eligibility: 10 years of Credited Service. Requires Medical Board determination that the member is physically or mentally incapacitated while an active member.
- b. Benefits: Greater of $1/60$ times FAS times Credited Service or $1/3$ times FAS. The member may elect a service retirement benefit, if eligible.

3. Annuity Savings Accumulation Fund (ASAF)

The annuitized value of the ASAF balance, if any, is added to the benefit.

K. Death Benefits

1. Accidental Death Benefits

- a. Eligibility: No age or service requirement. Death due to the performance of duties while an active member.
- b. Benefits: A monthly pension is payable to the beneficiary equal to 50% of $1/12$ of annual wages earned during the year prior to death. The benefit is equal to 50% of $1/12$ of the annual wage rate if the member had less than one year of Credited Service.

2. Ordinary Death Benefits

- a. Eligibility:
 - i. Active members: No age or service requirement. Death during active employment while not in the performance of duties.
 - ii. Terminated vested members: Death after termination of employment and prior to benefit commencement.

iii. Retired Members: Death after benefit commencement.

b. Death benefit:

- i. Active members: Refund of BMC and the employee portion of AMC with interest plus a salary-based death benefit. The salary-based death benefit is equal to one year's wages times completed years of Credited Service up to 3 years. The salary-based portion of the death benefit is reduced 5% for each year the member remains in service beyond age 60 (to a maximum reduction of 50% at age 70).
- ii. Terminated vested members with 10 or more years of Credited Service: Refund of BMC and the employee portion of AMC, if any, with interest plus one half of the salary-based death benefit that would have been payable had the member died on the last day of active service as described above.
- iii. Terminated vested members with less than 10 years of Credited Service: Refund of BMC and the employee portion of AMC, if any, with interest.
- iv. Retirees: The active salary-based death benefit that would have been payable had the member died on the last day of active service times the Adjustment Factor described in the table below:

Year of Death	Adjustment Factor
1 st year after retirement	50%
2 nd year after retirement	25%
3 rd year or later after retirement	10% times the benefit in effect at age 60 or at retirement if earlier

c. Form of Payment: Lump sum.

L. Vested Retirement After Termination

1. Eligibility:

- a. Tier 4 Chapter 504 55/27 plan: 10 years of Credited Service.
- b. All other Tier 4 plans: 5 years of Credited Service.
- c. Tier 6 plan: 10 years of Credited Service.

2. Benefits:

a. Tier 4 plans:

A vested member may elect a service retirement benefit payable at age 62 or an early retirement benefit payable as early as age 55. The eligibility and benefit provisions for a benefit that commences prior to age 62 are the same as those for early retirement except that benefits are unreduced at age 55 if the member has earned the minimum service required for a Service Retirement benefit shown in subsection H above.

b. Tier 6 Plan:

The service retirement benefit is payable at age 63, but in no cases can the vested benefit be less than the annuity equivalent of the BMC.

3. Annuity Savings Accumulation Fund (ASAF)

The annuitized value of the ASAF balance, if any, is added to the benefit.

M. Forms of Payment

1. Normal Form of Payment: Single Life Annuity.
2. Optional Forms of Payment: Joint and Survivor Annuities, Certain and Life Annuities, and Pop-up Annuities.

N. Cost of Living Adjustments (COLA)

Annuity payments are increased annually on September 1st, but only after a pensioner has attained the applicable eligibility threshold. Some beneficiaries are not eligible for COLA increases. The COLA increase is equal to a base benefit times a COLA percentage. The COLA increase for a spouse receiving a joint & survivor annuity is one half of the COLA increase that would have been applicable to the member had he or she survived.

1. Eligibility Thresholds:

- a. Service Retirement and Vested Retirement: The earlier of (i) and (ii):
 - i. Attainment of age 62 and 5 years since commencement
 - ii. Attainment of age 55 and 10 years since commencement

- b. Disability Retirement: 5 years since commencement
 - c. Beneficiaries of an Accidental Death benefit: 5 years since commencement
2. Eligible beneficiaries: Spouses receiving a joint & survivor annuity. All others are non-eligible.
 3. Base Benefit: The lesser of \$18,000 and the maximum retirement allowance plus the sum of prior years' COLA increases.
 4. COLA percentage: 50% of the Consumer Price Index (CPI-U) based upon the 12 months ending March 31 prior to each September 1 effective date, rounded to the next highest 0.1%. Such percentage shall not be less than 1.0% nor greater than 3.0%.

O. Refund of BMC and AMC

Refunded with interest under some circumstances. Only the employee portion of AMC are refunded.

1. Employee Portion of AMC: The employee portion of AMC is 50% for all plans that require AMC.
2. Non-vested termination: BMC and employee portion of AMC are refunded with interest.
3. Vested termination: A member may elect a refund of BMC and the employee portion of AMC with interest in lieu of a pension benefit, but only if he or she has less than 10 years of Credited Service.
4. Ordinary death: BMC and the employee portion of AMC are refunded with interest.
5. Accidental death: The employee portion of AMC are refunded with interest.
6. Disability retirement: The employee portion of AMC are refunded with interest.
7. Service retirement: The employee portion of AMC are refunded with interest if the member retires on or after age 62.

P. Service and Early Retirement for Tier 4 Members with Tier 3 Rights

1. Eligibility: Age 55 and 5 years of Credited Service.
2. Benefits: These members may elect a Tier 3 benefit instead of a Tier 4 benefit. The benefit formula for Tier 3 is the same as the benefit formula for the Tier 4 Basic 62/5 plan except:

- a. Credited Service under the Tier 3 benefit formula is capped at 30 years,
 - b. The Tier 3 benefit formula includes an offset starting at age 62 equal to 50% of the Primary Social Security benefit, and
 - c. The Tier 3 reduction factors for early commencement are less than the factors applicable to the Basic Tier 4 62/5 plan.
3. Cost of Living Adjustments: Tier 3 retirement benefits may be adjusted annually by Escalation. A Tier 3 retirement benefit cannot be less than the initial benefit payable at the commencement date.
- a. Full Escalation: Applicable for benefits commencing on or after age 65. Equal to the lesser of 3% and the Consumer Price Index (CPI-U) for positive increases in the CPI-U, and the greater of -3% and the Consumer Price Index (CPI-U) for negative increases in the CPI-U.
 - b. Partial Escalation: Applicable for benefits commencing after age 62 and prior to age 65. Equal to full escalation reduced by 1/36 times the number of months that the age at commencement precedes age 65.

Q. Loans

A member may borrow up to 75% of the accumulated BMC with interest. A member's unpaid loan balance will reduce his or her retirement benefit.

R. Tax-deferred Annuity Program (TDA)

Members may elect to make voluntary employee contributions to the TRS TDA. A member's contributions to a TDA account are capped by the dollar limitations under §402(g)(1) of the Internal Revenue Code (IRC) on the exclusion for elective deferrals described in §402(g)(3), and the dollar limitation under §414(v)(2)(B)(i) of the IRC for catch-up contributions for members who have attained aged 50.

A member may withdraw his or her TDA account balance as a lump sum or convert the total accumulated balance into an annuity upon retirement.

S. Changes Since the Prior Valuation

None.

SECTION IX - CHAPTER AMENDMENTS

The June 30, 2018 (Lag) actuarial valuation results reflect the following Chapter amendments from the prior five years.

- **Chapter 41 of the Laws of 2016** (Chapter 41/16) provides up to three years of service credit to members of public retirement systems of the State of New York for military service. Chapter 41/16 removes the requirement that such military service occur during specified periods of hostilities.
- **Chapter 438 of the Laws of 2016** (Chapter 438/16), enacted on November 14, 2016, amended Retirement and Social Security Law Section 43 to eliminate restrictions upon transferring between public retirement systems.
- **Chapter 510 of the Laws of 2015** (Chapter 510/15), clarifies for Tier 6 the definition of multiple employers for the purpose of exclusion of wages and changes the plan year for contributions from April 1 - March 31 to January 1 - December 31.
- **Chapter 427 of the Laws of 2014** (Chapter 427/14), amended Military Law Section 243-d, effective November 4, 2014, to provide non-contributory retirement service credit for members of the New York City Retirement Systems called to active military duty on or after September 11, 2001 and prior to January 1, 2006 who did not receive his or her full salary from a participating employer and is otherwise eligible to receive retirement service credit for such service.

SECTION X - SUBSEQUENT EVENTS

The Board of Trustees, based on recommendations of the Actuary, adopted new factors that provide the adjustment necessary for a retiree to choose an alternative form of benefit payment that is actuarially equivalent to the benefit payable for only the retiree's lifetime (i.e. Maximum Retirement Allowance). The new Option Factors are effective for retirements on and after April 1, 2019 and produce, in almost all cases, a benefit that is greater than the benefit provided under the prior set of Option Factors.

For virtually all retirees who would have elected an Optional Retirement Allowance prior to these new Option Factors and were to elect an Optional Retirement Allowance under the new Option Factors, there will be a reduction in the actuarial gains. For those retirees who would have declined an Optional Retirement Allowance, but would now elect an Optional Retirement Allowance in light of more favorable new factors, no additional cost is expected.

SECTION XI - ACTUARIAL ASSUMPTIONS AND METHODS

The Actuary issued a Report entitled, "Proposed Changes in Actuarial Assumptions and Methods Used in Determining Employer Contributions for Fiscal Years Beginning on and After July 1, 2018 for the New York City Teachers' Retirement System," dated January 17, 2019. The actuarial assumptions and methods described in that report were adopted by the Board of Trustees at the February 28, 2019 Board meeting and are referred to as the "2019 A&M."

Beginning with the June 30, 2018 (Lag) actuarial valuation, the method used to determine the Actuarial Value of Assets was calculated by re-characterizing interest credited on TDA Fixed Fund account balances as investment income instead of as a cash disbursement.

The actuarial assumptions and a description of the actuarial methods follow.

Table XI-1
Active Retirement Rates

NEW YORK CITY TEACHERS' RETIREMENT SYSTEM					
PROBABILITIES OF SERVICE RETIREMENT					
Age	Reduced Service Retirement	Unreduced Service Retirement Probabilities For Members Who Did Not Elect an Improved Retirement Program		Unreduced Service Retirement Probabilities For Members Who Did Elect an Improved Retirement Program	
		Year 1	Ultimate	Year 1	Ultimate
55	2.50%	18.00%	0.00%	37.50%	0.00%
56	2.50%	18.00%	20.00%	37.50%	22.00%
57	2.50%	18.00%	20.00%	37.50%	22.00%
58	2.50%	18.00%	20.00%	37.50%	22.00%
59	3.75%	18.00%	20.00%	37.50%	22.00%
60	5.00%	18.00%	20.00%	37.50%	22.00%
61	6.25%	18.00%	20.00%	37.50%	22.00%
62	7.50% ¹	27.00%/18.00% ²	20.00%	50.00%	33.00%
63	0.00%	18.00%/27.00% ³	20.00%	37.50%	22.00%
64	0.00%	18.00%	20.00%	37.50%	22.00%
65	0.00%	27.00%	20.00%	50.00%	33.00%
66	0.00%	18.00%	20.00%	37.50%	22.00%
67	0.00%	18.00%	20.00%	37.50%	22.00%
68	0.00%	18.00%	20.00%	37.50%	22.00%
69	0.00%	18.00%	20.00%	37.50%	22.00%
70	0.00%	20.00%	20.00%	37.50%	22.00%
71	0.00%	20.00%	20.00%	37.50%	22.00%
72	0.00%	20.00%	20.00%	37.50%	22.00%
73	0.00%	20.00%	20.00%	37.50%	22.00%
74	0.00%	20.00%	20.00%	37.50%	22.00%
75	0.00%	20.00%	20.00%	37.50%	22.00%
76	0.00%	20.00%	20.00%	37.50%	22.00%
77	0.00%	20.00%	20.00%	37.50%	22.00%
78	0.00%	20.00%	20.00%	37.50%	22.00%
79	0.00%	20.00%	20.00%	37.50%	22.00%
80+	N/A	100.00%	100.00%	100.00%	100.00%

¹ 7.50% only applies to Tier 6 members; 0.00% otherwise.

² 27.00% for Tier 1, 2, & 4 members and 18.00% for Tier 6 members.

³ 18.00% for Tier 1, 2, & 4 members and 27.00% for Tier 6 members.

Table XI-2
Active Termination Rates

NEW YORK CITY TEACHERS' RETIREMENT SYSTEM	
PROBABILITIES OF TERMINATION	
Years of Service	Probability of Termination
0	9.00%
1	8.00%
2	7.00%
3	6.00%
4	5.00%
5	4.00%
6	3.50%
7	3.05%
8	2.65%
9	2.30%
10	2.00%
11	1.75%
12	1.55%
13	1.40%
14	1.30%
15	1.25%
16	1.20%
17	1.15%
18	1.10%
19	1.05%
20	1.00%
21	0.90%
22	0.80%
23	0.70%
24	0.60%
25+	0.50%

Table XI-3
Active Disability Rates

NEW YORK CITY TEACHERS' RETIREMENT SYSTEM				
PROBABILITIES OF DISABILITY RETIREMENT				
	Ordinary Disability		Accidental Disability	
Age	Males	Females	Males	Females
15	0.01%	0.01%	0.00%	0.00%
16	0.01%	0.01%	0.00%	0.00%
17	0.01%	0.01%	0.00%	0.00%
18	0.01%	0.01%	0.00%	0.00%
19	0.01%	0.01%	0.00%	0.00%
20	0.01%	0.01%	0.00%	0.00%
21	0.01%	0.01%	0.00%	0.00%
22	0.01%	0.01%	0.00%	0.00%
23	0.01%	0.01%	0.00%	0.00%
24	0.01%	0.01%	0.00%	0.00%
25	0.01%	0.01%	0.00%	0.00%
26	0.01%	0.01%	0.00%	0.00%
27	0.01%	0.01%	0.00%	0.00%
28	0.01%	0.01%	0.00%	0.00%
29	0.01%	0.01%	0.00%	0.00%
30	0.01%	0.01%	0.00%	0.00%
31	0.02%	0.01%	0.00%	0.00%
32	0.03%	0.02%	0.00%	0.00%
33	0.04%	0.03%	0.01%	0.00%
34	0.05%	0.04%	0.01%	0.00%
35	0.06%	0.05%	0.01%	0.01%
36	0.07%	0.06%	0.01%	0.01%
37	0.08%	0.07%	0.01%	0.01%
38	0.08%	0.08%	0.02%	0.01%
39	0.09%	0.09%	0.02%	0.01%
40	0.10%	0.10%	0.02%	0.01%
41	0.11%	0.11%	0.02%	0.01%
42	0.12%	0.12%	0.02%	0.01%
43	0.13%	0.13%	0.02%	0.02%
44	0.14%	0.14%	0.02%	0.02%
45	0.15%	0.15%	0.03%	0.02%
46	0.15%	0.16%	0.03%	0.02%
47	0.15%	0.17%	0.03%	0.02%
48	0.15%	0.18%	0.03%	0.03%
49	0.15%	0.19%	0.03%	0.03%
50	0.15%	0.20%	0.03%	0.03%
51	0.15%	0.20%	0.03%	0.03%
52	0.15%	0.20%	0.03%	0.03%
53	0.15%	0.20%	0.03%	0.03%
54	0.15%	0.20%	0.03%	0.03%
55	0.15%	0.20%	0.04%	0.04%
56	0.15%	0.20%	0.04%	0.04%
57	0.15%	0.20%	0.04%	0.04%
58	0.15%	0.20%	0.04%	0.04%
59	0.15%	0.20%	0.04%	0.04%
60	0.15%	0.20%	0.04%	0.04%
61	0.15%	0.20%	0.04%	0.04%
62	0.15%	0.20%	0.04%	0.04%
63	0.15%	0.20%	0.04%	0.04%
64	0.15%	0.20%	0.04%	0.04%
65	0.15%	0.20%	0.04%	0.04%
66	0.15%	0.20%	0.04%	0.04%
67	0.15%	0.20%	0.04%	0.04%
68	0.15%	0.20%	0.04%	0.04%
69	0.15%	0.20%	0.04%	0.04%
70	0.15%	0.20%	0.04%	0.04%
71	0.15%	0.20%	0.04%	0.04%
72	0.15%	0.20%	0.04%	0.04%
73	0.15%	0.20%	0.04%	0.04%
74	0.15%	0.20%	0.04%	0.04%
75	0.15%	0.20%	0.04%	0.04%
76	0.15%	0.20%	0.04%	0.04%
77	0.15%	0.20%	0.04%	0.04%
78	0.15%	0.20%	0.04%	0.04%
79	0.15%	0.20%	0.04%	0.04%
80+	N/A	N/A	N/A	N/A

Table XI-4
Active Mortality Rates

NEW YORK CITY TEACHERS' RETIREMENT SYSTEM			
PROBABILITIES OF MORTALITY FOR ACTIVE MEMBERS			
	Ordinary Death		Accidental Death
Age	Males	Females	
15	0.040%	0.025%	0.000%
16	0.040%	0.025%	0.000%
17	0.040%	0.025%	0.000%
18	0.040%	0.025%	0.000%
19	0.040%	0.025%	0.000%
20	0.040%	0.025%	0.000%
21	0.040%	0.025%	0.000%
22	0.040%	0.025%	0.000%
23	0.040%	0.025%	0.000%
24	0.040%	0.025%	0.000%
25	0.040%	0.025%	0.000%
26	0.040%	0.025%	0.000%
27	0.040%	0.025%	0.000%
28	0.040%	0.025%	0.000%
29	0.040%	0.025%	0.000%
30	0.040%	0.025%	0.000%
31	0.042%	0.026%	0.000%
32	0.044%	0.028%	0.000%
33	0.046%	0.029%	0.000%
34	0.048%	0.030%	0.000%
35	0.050%	0.031%	0.000%
36	0.052%	0.033%	0.000%
37	0.054%	0.034%	0.000%
38	0.056%	0.035%	0.000%
39	0.058%	0.036%	0.000%
40	0.060%	0.038%	0.000%
41	0.070%	0.044%	0.000%
42	0.080%	0.050%	0.000%
43	0.090%	0.056%	0.000%
44	0.100%	0.063%	0.000%
45	0.110%	0.069%	0.000%
46	0.120%	0.075%	0.000%
47	0.130%	0.081%	0.000%
48	0.140%	0.088%	0.000%
49	0.150%	0.094%	0.000%
50	0.160%	0.100%	0.000%
51	0.170%	0.106%	0.000%
52	0.180%	0.113%	0.000%
53	0.190%	0.119%	0.000%
54	0.200%	0.125%	0.000%
55	0.210%	0.131%	0.000%
56	0.220%	0.138%	0.000%
57	0.230%	0.144%	0.000%
58	0.240%	0.150%	0.000%
59	0.250%	0.156%	0.000%
60	0.260%	0.163%	0.000%
61	0.270%	0.169%	0.000%
62	0.280%	0.175%	0.000%
63	0.290%	0.181%	0.000%
64	0.300%	0.188%	0.000%
65	0.320%	0.200%	0.000%
66	0.350%	0.219%	0.000%
67	0.390%	0.244%	0.000%
68	0.440%	0.275%	0.000%
69	0.500%	0.313%	0.000%
70	0.540%	0.350%	0.000%
71	0.600%	0.388%	0.000%
72	0.650%	0.425%	0.000%
73	0.700%	0.463%	0.000%
74	0.750%	0.525%	0.000%
75	0.800%	0.588%	0.000%
76	0.890%	0.650%	0.000%
77	0.980%	0.713%	0.000%
78	1.070%	0.775%	0.000%
79	1.160%	0.925%	0.000%
80+	N/A	N/A	N/A

Table XI-5
Service Retiree Mortality

NEW YORK CITY TEACHERS' RETIREMENT SYSTEM					
PROBABILITIES OF MORTALITY FOR SERVICE RETIREES					
BASE TABLE					
Age	Males	Females	Age	Males	Females
15	0.0108%	0.0105%	68	1.3827%	0.8399%
16	0.0146%	0.0128%	69	1.5070%	0.8992%
17	0.0197%	0.0140%	70	1.6306%	0.9855%
18	0.0222%	0.0145%	71	1.7953%	1.1072%
19	0.0235%	0.0151%	72	1.9579%	1.2311%
20	0.0246%	0.0153%	73	2.1191%	1.3549%
21	0.0263%	0.0162%	74	2.2784%	1.4775%
22	0.0278%	0.0171%	75	2.4370%	1.5961%
23	0.0295%	0.0181%	76	2.7233%	1.8356%
24	0.0309%	0.0193%	77	3.0074%	2.0765%
25	0.0320%	0.0206%	78	3.2885%	2.3162%
26	0.0335%	0.0220%	79	3.5677%	2.5533%
27	0.0347%	0.0234%	80	3.8824%	2.7842%
28	0.0364%	0.0249%	81	4.4474%	3.3221%
29	0.0386%	0.0267%	82	5.0193%	3.8708%
30	0.0418%	0.0286%	83	5.5977%	4.4089%
31	0.0476%	0.0348%	84	6.1798%	5.0027%
32	0.0532%	0.0401%	85	6.7676%	5.5878%
33	0.0583%	0.0449%	86	7.7139%	6.2981%
34	0.0629%	0.0489%	87	8.6843%	6.9333%
35	0.0673%	0.0527%	88	9.6857%	7.5758%
36	0.0698%	0.0557%	89	10.7135%	8.5620%
37	0.0720%	0.0591%	90	11.7744%	9.6778%
38	0.0745%	0.0626%	91	13.6049%	10.8390%
39	0.0782%	0.0672%	92	15.5105%	11.9717%
40	0.0837%	0.0726%	93	17.4679%	13.1425%
41	0.0941%	0.0775%	94	19.5105%	15.1670%
42	0.1051%	0.0838%	95	21.6689%	17.3761%
43	0.1167%	0.0918%	96	23.7343%	19.5275%
44	0.1294%	0.1013%	97	25.7571%	21.6213%
45	0.1432%	0.1132%	98	27.8633%	23.3643%
46	0.1582%	0.1271%	99	29.8272%	23.8705%
47	0.1744%	0.1429%	100	31.5152%	23.9898%
48	0.1918%	0.1597%	101	33.0771%	24.9134%
49	0.2102%	0.1774%	102	34.4234%	26.0067%
50	0.2317%	0.1950%	103	35.6398%	27.2992%
51	0.2657%	0.2130%	104	36.6357%	28.7614%
52	0.3011%	0.2304%	105	37.3430%	30.3385%
53	0.3373%	0.2472%	106	37.7004%	31.9944%
54	0.3744%	0.2638%	107	37.8599%	33.6898%
55	0.4112%	0.2806%	108	38.0314%	35.3785%
56	0.4578%	0.3034%	109	38.1998%	37.0129%
57	0.5025%	0.3264%	110	50.0000%	50.0000%
58	0.5448%	0.3498%	111	50.0000%	50.0000%
59	0.5843%	0.3732%	112	50.0000%	50.0000%
60	0.6211%	0.3973%	113	50.0000%	50.0000%
61	0.7018%	0.4321%	114	50.0000%	50.0000%
62	0.7804%	0.4686%	115	50.0000%	50.0000%
63	0.8588%	0.5072%	116	50.0000%	50.0000%
64	0.9371%	0.5479%	117	50.0000%	50.0000%
65	0.9994%	0.5912%	118	50.0000%	50.0000%
66	1.1295%	0.6619%	119	50.0000%	50.0000%
67	1.2569%	0.7367%	120	100.0000%	100.0000%

Table XI-6
Disabled Retiree Mortality

NEW YORK CITY TEACHERS' RETIREMENT SYSTEM					
PROBABILITIES OF MORTALITY FOR DISABLED RETIREES					
BASE TABLE					
Age	Males	Females	Age	Males	Females
15	0.3819%	0.3483%	68	2.8007%	2.0012%
16	0.5167%	0.4712%	69	2.8946%	2.0043%
17	0.6964%	0.5141%	70	3.0268%	2.0073%
18	0.7863%	0.5351%	71	3.1148%	2.0103%
19	0.8312%	0.5569%	72	3.2684%	2.1811%
20	0.8353%	0.5649%	73	3.3926%	2.3760%
21	0.8659%	0.5961%	74	3.5875%	2.5968%
22	0.8978%	0.6295%	75	3.7271%	2.8417%
23	0.9464%	0.6597%	76	3.9657%	3.0808%
24	0.9977%	0.6908%	77	4.2691%	3.3373%
25	1.0424%	0.7150%	78	4.5349%	3.6085%
26	1.0960%	0.7387%	79	4.8252%	3.8944%
27	1.1348%	0.7520%	80	5.1378%	4.1909%
28	1.1774%	0.7625%	81	5.6917%	4.6921%
29	1.2163%	0.7686%	82	6.2841%	5.1536%
30	1.2878%	0.7763%	83	6.8835%	5.5061%
31	1.3554%	0.9885%	84	7.7954%	6.1180%
32	1.3755%	1.1922%	85	8.8286%	6.7342%
33	1.3953%	1.3874%	86	9.9032%	7.3088%
34	1.4153%	1.3942%	87	10.8837%	8.2536%
35	1.4357%	1.4012%	88	11.9567%	9.3264%
36	1.4563%	1.4082%	89	13.8059%	10.3734%
37	1.4772%	1.4152%	90	15.7270%	11.4459%
38	1.4985%	1.4223%	91	17.7012%	12.6271%
39	1.5200%	1.4294%	92	19.6428%	14.1350%
40	1.5418%	1.4366%	93	21.9234%	15.4424%
41	1.5640%	1.4436%	94	24.0761%	16.9560%
42	1.5865%	1.4509%	95	26.0577%	18.4261%
43	1.6093%	1.4581%	96	28.3614%	20.1727%
44	1.6324%	1.4654%	97	30.3483%	21.6213%
45	1.6559%	1.5299%	98	31.8739%	23.3643%
46	1.6797%	1.6016%	99	33.6652%	23.8705%
47	1.7038%	1.6623%	100	35.0392%	23.9898%
48	1.7283%	1.7238%	101	36.0496%	24.9134%
49	1.7531%	1.7485%	102	37.0460%	26.0067%
50	1.7783%	1.7736%	103	37.7767%	27.2992%
51	1.8039%	1.7991%	104	38.1460%	28.7614%
52	1.9408%	1.8530%	105	38.3076%	30.3385%
53	2.0713%	1.8909%	106	38.4698%	31.9944%
54	2.2040%	1.9173%	107	38.6325%	33.6898%
55	2.3207%	1.9622%	108	38.8076%	35.3785%
56	2.4304%	1.9652%	109	38.9794%	37.0129%
57	2.4937%	1.9681%	110	50.0000%	50.0000%
58	2.5070%	1.9711%	111	50.0000%	50.0000%
59	2.5245%	1.9741%	112	50.0000%	50.0000%
60	2.5362%	1.9770%	113	50.0000%	50.0000%
61	2.5394%	1.9801%	114	50.0000%	50.0000%
62	2.5426%	1.9831%	115	50.0000%	50.0000%
63	2.5480%	1.9861%	116	50.0000%	50.0000%
64	2.5797%	1.9891%	117	50.0000%	50.0000%
65	2.6258%	1.9921%	118	50.0000%	50.0000%
66	2.6510%	1.9951%	119	50.0000%	50.0000%
67	2.7083%	1.9982%	120	100.0000%	100.0000%

Table XI-7
Beneficiary Mortality

NEW YORK CITY TEACHERS' RETIREMENT SYSTEM					
PROBABILITIES OF MORTALITY FOR BENEFICIARIES					
BASE TABLE					
Age	Males	Females	Age	Males	Females
15	0.0105%	0.0092%	68	1.8256%	1.3605%
16	0.0142%	0.0112%	69	1.9386%	1.4332%
17	0.0191%	0.0122%	70	2.0542%	1.5007%
18	0.0222%	0.0133%	71	2.2359%	1.6745%
19	0.0240%	0.0143%	72	2.4230%	1.8463%
20	0.0251%	0.0145%	73	2.6165%	2.0157%
21	0.0268%	0.0153%	74	2.8157%	2.1838%
22	0.0284%	0.0161%	75	3.0220%	2.3492%
23	0.0301%	0.0171%	76	3.4928%	2.6652%
24	0.0315%	0.0183%	77	3.9787%	2.9831%
25	0.0327%	0.0195%	78	4.4792%	3.3011%
26	0.0342%	0.0208%	79	4.9963%	3.6207%
27	0.0354%	0.0221%	80	5.5282%	3.9391%
28	0.0371%	0.0236%	81	6.1051%	4.4386%
29	0.0394%	0.0252%	82	6.6894%	4.9473%
30	0.0427%	0.0270%	83	7.2805%	5.4665%
31	0.0495%	0.0330%	84	7.8749%	5.9942%
32	0.0562%	0.0384%	85	8.4753%	6.5354%
33	0.0625%	0.0431%	86	9.6136%	7.4659%
34	0.0682%	0.0471%	87	10.8005%	8.3995%
35	0.0743%	0.0511%	88	12.0443%	9.3428%
36	0.0780%	0.0542%	89	13.3397%	10.2918%
37	0.0818%	0.0579%	90	14.6958%	11.2477%
38	0.0861%	0.0618%	91	16.4185%	12.8868%
39	0.0917%	0.0666%	92	18.1416%	14.4887%
40	0.0997%	0.0719%	93	19.8574%	16.0801%
41	0.1394%	0.0775%	94	21.6187%	17.5854%
42	0.1774%	0.0859%	95	23.5884%	19.0626%
43	0.2143%	0.0968%	96	25.4266%	20.2474%
44	0.2507%	0.1111%	97	27.2119%	21.2937%
45	0.2875%	0.1287%	98	29.0202%	22.0663%
46	0.3207%	0.1501%	99	30.6654%	22.5443%
47	0.3534%	0.1748%	100	32.1584%	22.6473%
48	0.3849%	0.2022%	101	33.7521%	23.5294%
49	0.4150%	0.2319%	102	35.1259%	24.5619%
50	0.4431%	0.2633%	103	36.3671%	25.7825%
51	0.5156%	0.2999%	104	37.3834%	27.1635%
52	0.5928%	0.3376%	105	38.1051%	28.6530%
53	0.6740%	0.3762%	106	38.4698%	30.2169%
54	0.7583%	0.4151%	107	38.6325%	31.8182%
55	0.8440%	0.4540%	108	38.8076%	33.4131%
56	0.9048%	0.5132%	109	38.9794%	34.9566%
57	0.9604%	0.5735%	110	50.0000%	50.0000%
58	1.0101%	0.6353%	111	50.0000%	50.0000%
59	1.0536%	0.6981%	112	50.0000%	50.0000%
60	1.0919%	0.7631%	113	50.0000%	50.0000%
61	1.1835%	0.8329%	114	50.0000%	50.0000%
62	1.2676%	0.8908%	115	50.0000%	50.0000%
63	1.3473%	0.9493%	116	50.0000%	50.0000%
64	1.4238%	1.0146%	117	50.0000%	50.0000%
65	1.4985%	1.0876%	118	50.0000%	50.0000%
66	1.6059%	1.1681%	119	50.0000%	50.0000%
67	1.7146%	1.2609%	120	100.0000%	100.0000%

Table XI-8
Salary Scale

NEW YORK CITY TEACHERS' RETIREMENT SYSTEM		
ANNUAL RATES OF MERIT AND SALARY INCREASE		
Years of Service	Merit Increase	Salary Increase ¹
0	10.00%	13.00%
1	8.00%	11.00%
2	6.00%	9.00%
3	5.00%	8.00%
4	6.00%	9.00%
5	5.00%	8.00%
6	5.00%	8.00%
7	4.00%	7.00%
8	2.00%	5.00%
9	5.00%	8.00%
10	1.00%	4.00%
11	1.00%	4.00%
12	3.00%	6.00%
13	1.00%	4.00%
14	5.00%	8.00%
15	1.00%	4.00%
16	1.00%	4.00%
17	2.00%	5.00%
18	1.00%	4.00%
19	9.00%	12.00%
20	1.00%	4.00%
21	5.00%	8.00%
22+	1.00%	4.00%

¹Salary Increase is the General Wage Increase of 3.00% plus the Merit Increase.

Additional Assumptions and Methods

1. **Post-commencement Mortality Assumption:** The service retiree mortality, disabled retiree mortality, and beneficiary mortality base tables are projected from 2012 using mortality improvement scale MP-2018. The base tables are also multiplied by adjustment factors to convert them from lives-weighted to amounts-weighted tables to account for socioeconomic effects on mortality. The adjustment factors used are as follows:

	Adjustment Factor	
	Male	Female
Service Retiree	0.908	0.944
Disabled Retiree	0.940	0.962
Beneficiary	0.890	0.951

2. **Marital Assumption:** All active members are assumed to be married and females are assumed to be three years younger than their male spouses.
3. **Credited Service:** Calculated in whole year increments for valuation purposes.
4. **Actuarial Interest Rate (AIR):** 7.0% per annum, net of investment expenses.
5. **COLA:** Based on an assumed long-term Consumer Price Index inflation rate of 2.5% per year, 1.5% per year for Auto COLA, and 2.5% per year for Escalation.
6. **Actuarial Asset Valuation Method (AAVM):**

The AAVM recognizes investment returns greater or less than expected over a period of six years.

In accordance with this AAVM, Unexpected Investment Return (UIR) are phased into the Actuarial Value of Assets (AVA) at rates of 15%, 15%, 15%, 15%, 20%, and 20% per year (i.e. cumulative rates of 15%, 30%, 45%, 60%, 80%, and 100% over a period of six years).

The AVA is further constrained to be within a corridor of 80% to 120% of the MVA.

Beginning with the June 30, 2018 (Lag) actuarial valuation, the method used to determine the Actuarial Value of Assets was calculated by re-characterizing interest credited on TDA Fixed Fund account balances as investment income instead of as a cash disbursement.

For more information, see SECTION II – MARKET AND ACTUARIAL VALUES OF ASSETS.

7. **Actuarial Cost Method:** The Entry Age Normal (EAN) cost method of funding is used by the Actuary to calculate the Employer Contribution.

Under this method, the Present Value (PV) of Future Benefits (PVFB) of each individual included in the actuarial valuation is allocated on a level basis over the earnings (or service) of the individual between entry age and the assumed exit age(s). The employer portion of this PVFB allocated to a valuation year is the Normal Cost. The portion of this PVFB not provided for at a valuation date by the PV of Future Normal Costs or future member contributions is the Accrued Liability (AL).

The excess, if any, of the AL over the Actuarial Value of Assets (AVA) is the Unfunded Accrued Liability (UAL).

Under this method, actuarial gains and losses, as they occur, reduce and increase the UAL, respectively, and are explicitly identified and amortized.

Increases or decreases in obligations due to benefit changes, actuarial assumption changes, and actuarial method changes are also explicitly identified and amortized.

Under EAN, the explicit UALs that are developed each year are generally financed over fixed periods. Ideally, these periods are reasonably consistent with the expected future working lifetimes of all active participants. For more information see Page 12.

Under EAN, the Normal Cost as a percentage of pay remains constant by individual and changes gradually over time for the entire plan as the characteristics of the group changes (e.g. more Tier 6 active members decrease the average Normal Cost as a percentage of pay).

8. **Allowances for Administrative Expenses:** The Employer Contribution for a fiscal year is increased by the interest-adjusted amount of administrative expenses paid from TRS during the second prior fiscal year.
9. **WTC Disability and Death Benefits:** Obligations attributable to the WTC Disability Benefits Law and to the WTC Death Benefits Law are determined through the use of explicit assumptions in the 2019 A&M, and through estimation techniques for post-retirement reclassifications.
10. **One-Year Lag Methodology (OYLM):** One-Year Lag Methodology uses a June 30, XX-2 valuation date to determine Fiscal Year XX employer contributions.

This Methodology requires adjustments to certain components used to determine Fiscal Year XX employer contributions as follows:

a. Normal Cost

The normal cost as of June 30, XX-2 is rolled forward with the assumed AIR of 7.0% to derive the normal cost as of December 31, XX-1.

b. UAL Payments

For determining the UAL payments for Fiscal Year XX, and to be consistent with the OYLM, the UAL as of June 30, XX-2 is adjusted by the discounted value of employer normal cost and UAL payments paid during Fiscal Year XX-1 and the discounted value of Administrative Expenses reimbursed during Fiscal Years XX-1 and XX.

11. **Excess Benefit Plan:** The valuation includes liabilities and costs, if any, associated with benefits in excess of the Internal Revenue Code Section 415 limitation.

12. **Term Cost for TDA Fixed Fund:** A cost is added to each year's Normal Cost for providing a guaranteed 8.25% return on the TDA Fixed Fund for non-UFT members.

SECTION XII - SUMMARY OF DEMOGRAPHIC DATA

The June 30, 2018 (Lag) and June 30, 2017 (Lag) actuarial valuations are based upon census data as of those dates submitted by the Plan's administrative staff and the employers' payroll facilities. Financial information was provided by the Office of the Comptroller as of June 30, 2018 and June 30, 2017.

Consistent with Actuarial Standards of Practice, the Office of the Actuary has reviewed census data and financial information for consistency and reasonability but has not audited it. The accuracy of the results and calculations contained in this Report are dependent on the accuracy of this census data and financial information. To the extent any such data or information provided is materially inaccurate or incomplete, the results contained herein will require revision.

Table XII-1
Status Reconciliation

CHANGES IN THE NUMBER OF ACTIVES AND PENSIONERS DURING THE FISCAL YEAR CLASSIFIED BY STATUS										
Status	(1) Active Members	(2) Active Off Payroll	(3) Deferred Vested	(4) Service Pension	(5) Ordinary Disability	(6) Accidental Disability	(7) Accidental Death	(8) Other Beneficiary	(9) Pensioners Subtotal (4) to (8)	(10) Grand Total (1) + (2) + (3) + (9)
1. Number at June 30, 2017	120,826	7,997	15,279	76,973	2,549	744	0	4,504	84,770	228,872
New Entrants	8,797	924	281	0	0	0	0	0	0	10,002
Rehires	1,473	(1,116)	(228)	0	0	0	0	0	0	129
Leaving Active Payroll	(5,092)	5,092	0	0	0	0	0	0	0	0
Vested Termination	(747)	(729)	1,476	0	0	0	0	0	0	0
Non-Vested Termination / Cashout	(918)	(1,966)	0	0	0	0	0	0	0	(2,884)
Accidental Death (from Active)	0	0	0	0	0	0	0	0	0	0
Ordinary Death (from Active)	(89)	(21)	(50)	0	0	0	0	0	0	(160)
Service Retirement	(2,421)	(633)	(323)	3,377	0	0	0	0	3,377	0
Ordinary Disability Retirement	(57)	(111)	(1)	0	169	0	0	0	169	0
Accidental Disability Retirement	(8)	(21)	(1)	0	0	30	0	0	30	0
Death with Beneficiary	0	0	0	(394)	(16)	(2)	0	0	(412)	(412)
Death without Beneficiary	0	0	0	(1,566)	(63)	(18)	0	(385)	(2,032)	(2,032)
On/(Off) Pension Payroll	0	0	0	(26)	1	3	0	415	393	393
Net Change	938	1,419	1,154	1,391	91	13	0	30	1,525	5,036
2. Number at June 30, 2018	121,764	9,416	16,433	78,364	2,640	757	0	4,534	86,295	233,908

**Graph XII-2
Headcount Summary by Status**

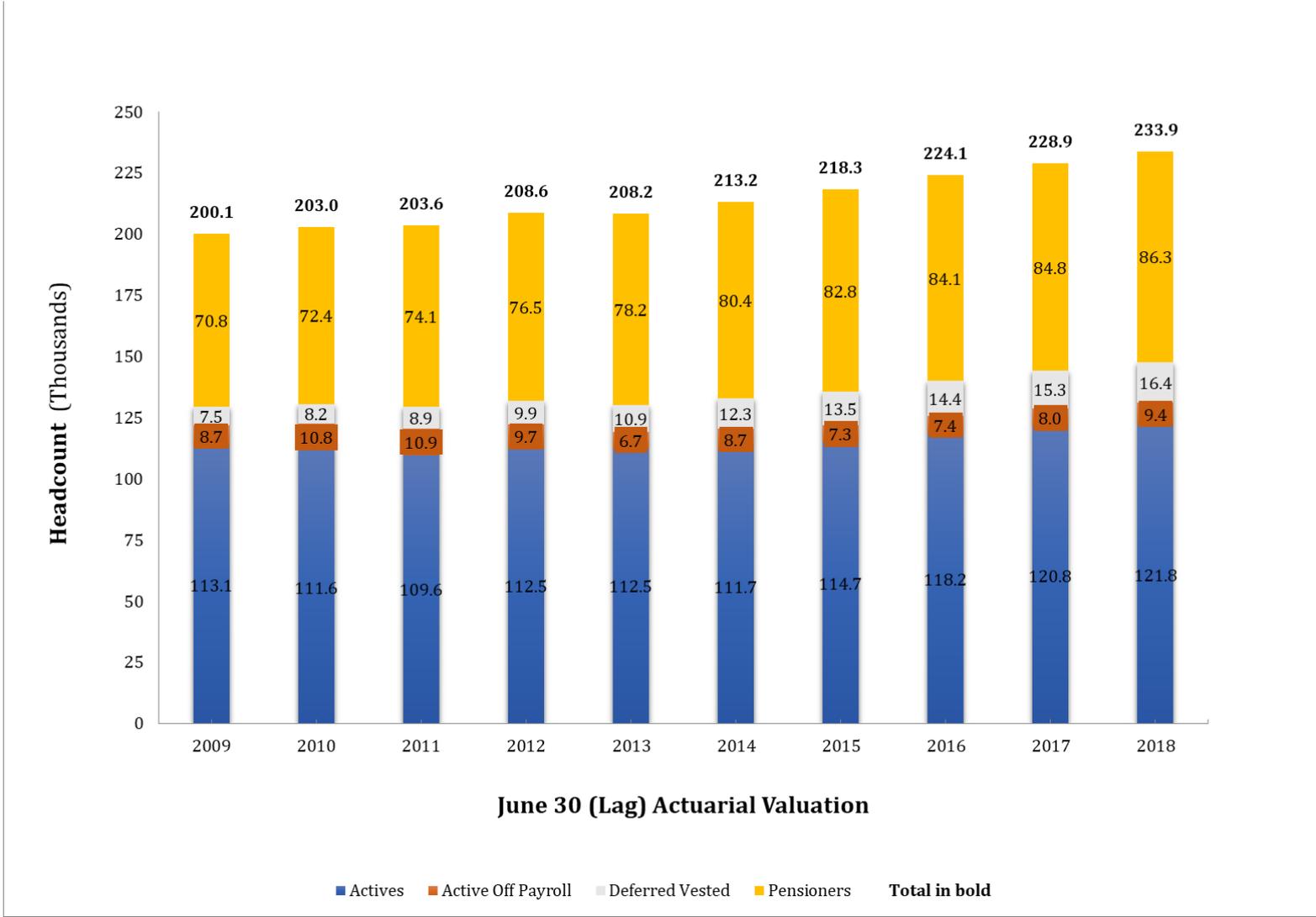


Table XII-3
Summary of Active Membership

NEW YORK CITY TEACHERS' RETIREMENT SYSTEM		
ACTIVE MEMBERS INCLUDED IN THE JUNE 30, 2018 (LAG) AND THE JUNE 30, 2017 (LAG) ACTUARIAL VALUATIONS		
	June 30, 2018 (Lag)	June 30, 2017 (Lag)
Number		
Males	27,369	27,312
Females	94,395	93,514
Total	121,764	120,826
Annual Salary ¹		
Males	\$ 2,478,047,028	\$ 2,362,727,020
Females	7,926,356,656	7,486,172,212
Total	\$ 10,404,403,684	\$ 9,848,899,232
Average Salary ¹		
Males	\$ 90,542	\$ 86,509
Females	83,970	80,054
Total Average	\$ 85,447	\$ 81,513
Average Age		
Males	44.0	44.0
Females	43.9	43.8
Total Average	43.9	43.9
Average Past Service		
Males	11.6	11.4
Females	11.6	11.4
Total Average	11.6	11.4

¹Salaries reflect the impact of recent labor contract settlements and certain non-union salary increases with retroactive effective dates, if any.

Graph XII-4
Active Membership by Tier

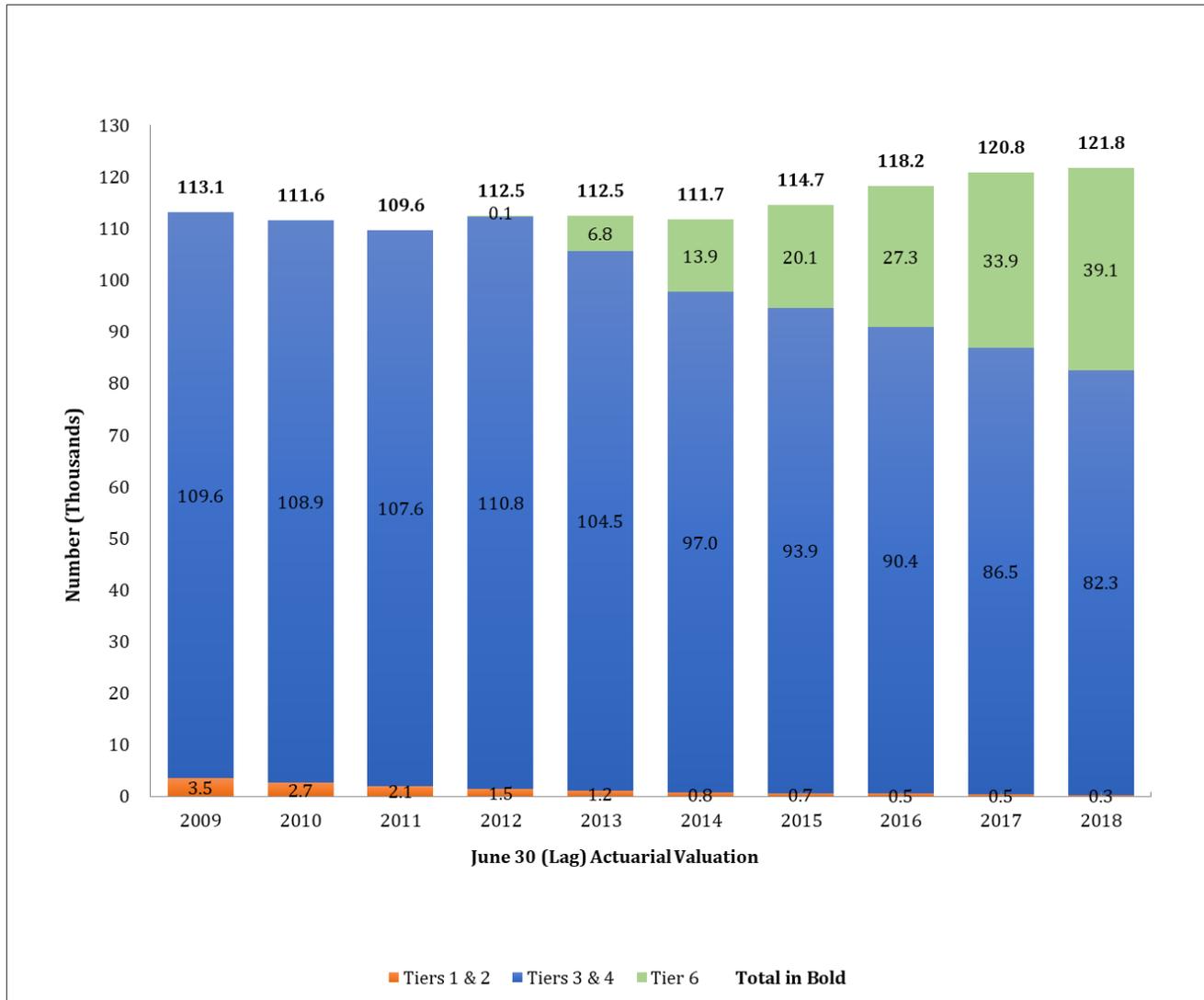


Table XII-5
Historical Active Member Salary Data

June 30 (Lag) Actuarial Valuation	Number	Annual Salary	Average Annual Salary	Percentage Increase/ (Decrease) In Avg. Salary
2009	113,132	8,016,635,700	70,861	0.5%
2010	111,647	7,979,671,378	71,472	0.9%
2011	109,636	7,888,203,642	71,949	0.7%
2012	112,460	8,013,395,184	71,256	- 1.0%
2013	112,481	8,128,378,071	72,264	1.4%
2014	111,726	8,274,685,657	74,062	2.5%
2015	114,652	8,844,650,633	77,143	4.2%
2016	118,201	9,224,267,647	78,039	1.2%
2017	120,826	9,848,899,232	81,513	4.5%
2018	121,764	10,404,403,684	85,447	4.8%

Salaries reflect the impact of recent labor contract settlements and certain non-union salary increases with retroactive effective dates, if any.

Table XII-6
Detailed Active Membership and Salaries as of June 30, 2018

AGE \ SVC	Male Total									
	UNDER 5	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40 & UP	ALL YEARS
<i>NUMBER:</i>										
UNDER 20	0	0	0	0	0	0	0	0	0	0
20 TO 24	306	0	0	0	0	0	0	0	0	306
25 TO 29	2,279	339	2	0	0	0	0	0	0	2,620
30 TO 34	1,896	1,588	412	2	0	0	0	0	0	3,898
35 TO 39	1,053	1,095	1,723	341	0	0	0	0	0	4,212
40 TO 44	602	631	1,182	1,292	166	4	0	0	0	3,877
45 TO 49	442	463	751	1,139	745	126	7	0	0	3,673
50 TO 54	306	327	506	718	611	530	138	0	0	3,136
55 TO 59	189	265	411	502	431	405	289	23	1	2,516
60 TO 64	113	241	259	385	311	261	159	67	13	1,809
65 TO 69	53	122	166	196	148	99	66	39	16	905
70 & UP	14	57	69	74	59	39	38	14	53	417
TOTAL	7,253	5,128	5,481	4,649	2,471	1,464	697	143	83	27,369

<i>SALARIES (IN THOUSANDS):</i>										
UNDER 20	0	0	0	0	0	0	0	0	0	0
20 TO 24	15,797	0	0	0	0	0	0	0	0	15,797
25 TO 29	140,249	24,915	268	0	0	0	0	0	0	165,432
30 TO 34	125,537	131,217	40,112	222	0	0	0	0	0	297,088
35 TO 39	73,971	89,908	172,557	37,246	0	0	0	0	0	373,682
40 TO 44	41,905	51,485	117,230	144,169	20,161	471	0	0	0	375,421
45 TO 49	31,137	33,933	72,997	124,872	90,510	16,102	745	0	0	370,296
50 TO 54	21,279	23,262	45,060	76,498	74,090	67,318	17,577	0	0	325,084
55 TO 59	12,225	17,432	36,058	50,579	48,607	51,916	37,494	3,081	159	257,550
60 TO 64	6,874	14,061	21,024	38,969	34,211	31,392	20,203	8,917	1,642	177,293
65 TO 69	3,194	6,394	12,657	18,171	16,337	12,005	7,653	4,993	2,100	83,503
70 & UP	483	2,155	4,463	6,510	5,784	4,194	4,924	1,614	6,773	36,900
TOTAL *	472,652	394,762	522,426	497,234	289,701	183,397	88,595	18,605	10,674	2,478,047

<i>AVERAGE SALARIES: **</i>										
UNDER 20	0	0	0	0	0	0	0	0	0	0
20 TO 24	51,625	0	0	0	0	0	0	0	0	51,625
25 TO 29	61,540	73,496	134,063	0	0	0	0	0	0	63,142
30 TO 34	66,212	82,630	97,360	110,893	0	0	0	0	0	76,216
35 TO 39	70,248	82,108	100,149	109,225	0	0	0	0	0	88,718
40 TO 44	69,609	81,593	99,179	111,586	121,451	117,719	0	0	0	96,833
45 TO 49	70,447	73,290	97,199	109,633	121,490	127,792	106,442	0	0	100,816
50 TO 54	69,539	71,139	89,051	106,543	121,261	127,015	127,368	0	0	103,662
55 TO 59	64,684	65,780	87,732	100,754	112,777	128,187	129,738	133,954	159,388	102,365
60 TO 64	60,830	58,346	81,174	101,218	110,005	120,275	127,060	133,094	126,307	98,006
65 TO 69	60,266	52,407	76,247	92,711	110,383	121,262	115,949	128,019	131,238	92,268
70 & UP	34,502	37,800	64,678	87,972	98,042	107,536	129,584	115,286	127,793	88,489
TOTAL	65,166	76,982	95,316	106,955	117,240	125,271	127,110	130,105	128,605	90,542

Note: Age is nearest birthday. Service is nearest year.

* Total may not add up due to rounding.

** Average based on unrounded salary.

Table XII-6
Detailed Active Membership and Salaries as of June 30, 2018 (cont'd)

AGE \ SVC	Female Total										
	UNDER 5	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40 & UP	ALL YEARS	
<i>NUMBER:</i>											
UNDER 20	0	0	0	0	0	0	0	0	0	0	0
20 TO 24	1,123	0	0	0	0	0	0	0	0	0	1,123
25 TO 29	8,692	1,457	2	0	0	0	0	0	0	0	10,151
30 TO 34	5,990	5,588	1,557	1	0	0	0	0	0	0	13,136
35 TO 39	3,270	3,216	5,910	1,363	3	0	0	0	0	0	13,762
40 TO 44	2,182	1,950	3,794	4,331	597	2	0	0	0	0	12,856
45 TO 49	1,788	1,555	2,493	3,445	2,566	479	7	0	0	0	12,333
50 TO 54	1,232	1,332	1,966	2,334	1,994	1,689	413	7	0	0	10,967
55 TO 59	771	933	1,621	2,082	1,713	1,203	972	93	0	0	9,388
60 TO 64	305	580	1,023	1,668	1,550	942	519	193	27	0	6,807
65 TO 69	87	218	416	659	650	453	264	102	70	0	2,919
70 & UP	14	92	125	168	163	119	112	51	109	0	953
TOTAL	25,454	16,921	18,907	16,051	9,236	4,887	2,287	446	206	0	94,395

<i>SALARIES (IN THOUSANDS):</i>											
UNDER 20	0	0	0	0	0	0	0	0	0	0	0
20 TO 24	59,529	0	0	0	0	0	0	0	0	0	59,529
25 TO 29	549,734	108,703	118	0	0	0	0	0	0	0	658,555
30 TO 34	399,183	464,869	147,405	121	0	0	0	0	0	0	1,011,578
35 TO 39	216,316	260,599	572,047	141,151	186	0	0	0	0	0	1,190,301
40 TO 44	137,777	147,032	353,621	454,786	66,150	191	0	0	0	0	1,159,557
45 TO 49	105,579	105,355	216,263	351,151	295,035	56,548	689	0	0	0	1,130,621
50 TO 54	70,708	81,484	152,155	219,437	215,154	199,021	47,914	622	0	0	986,494
55 TO 59	43,312	52,208	117,140	179,873	168,410	134,548	116,942	11,304	0	0	823,738
60 TO 64	17,011	32,118	73,597	140,351	143,271	93,547	57,381	24,732	3,259	0	585,267
65 TO 69	4,783	11,049	28,115	54,339	56,270	44,932	26,246	12,707	8,710	0	247,151
70 & UP	612	3,538	7,906	12,146	12,822	10,082	9,681	4,793	11,985	0	73,566
TOTAL*	1,604,544	1,266,955	1,668,367	1,553,356	957,300	538,870	258,853	54,159	23,954	0	7,926,357

<i>AVERAGE SALARIES: **</i>											
UNDER 20	0	0	0	0	0	0	0	0	0	0	0
20 TO 24	53,009	0	0	0	0	0	0	0	0	0	53,009
25 TO 29	63,246	74,607	59,224	0	0	0	0	0	0	0	64,876
30 TO 34	66,641	83,191	94,673	120,818	0	0	0	0	0	0	77,008
35 TO 39	66,152	81,032	96,793	103,559	62,158	0	0	0	0	0	86,492
40 TO 44	63,142	75,401	93,205	105,007	110,805	95,473	0	0	0	0	90,196
45 TO 49	59,049	67,753	86,748	101,931	114,979	118,054	98,448	0	0	0	91,674
50 TO 54	57,393	61,174	77,393	94,017	107,901	117,833	116,014	88,916	0	0	89,951
55 TO 59	56,177	55,958	72,264	86,394	98,313	111,844	120,311	121,548	0	0	87,744
60 TO 64	55,772	55,375	71,943	84,143	92,433	99,307	110,560	128,146	120,694	0	85,980
65 TO 69	54,982	50,683	67,584	82,457	86,569	99,187	99,417	124,581	124,427	0	84,670
70 & UP	43,715	38,452	63,245	72,300	78,666	84,726	86,438	93,979	109,957	0	77,194
TOTAL	63,037	74,875	88,241	96,776	103,649	110,266	113,185	121,432	116,281	0	83,970

Note: Age is nearest birthday. Service is nearest year.

* Total may not add up due to rounding.

** Average based on unrounded salary.

Table XII-6
Detailed Active Membership and Salaries as of June 30, 2018 (cont'd)

AGE \ SVC	Total										
	UNDER 5	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40 & UP	ALL YEARS	
<i>NUMBER:</i>											
UNDER 20	0	0	0	0	0	0	0	0	0	0	0
20 TO 24	1,429	0	0	0	0	0	0	0	0	0	1,429
25 TO 29	10,971	1,796	4	0	0	0	0	0	0	0	12,771
30 TO 34	7,886	7,176	1,969	3	0	0	0	0	0	0	17,034
35 TO 39	4,323	4,311	7,633	1,704	3	0	0	0	0	0	17,974
40 TO 44	2,784	2,581	4,976	5,623	763	6	0	0	0	0	16,733
45 TO 49	2,230	2,018	3,244	4,584	3,311	605	14	0	0	0	16,006
50 TO 54	1,538	1,659	2,472	3,052	2,605	2,219	551	7	0	0	14,103
55 TO 59	960	1,198	2,032	2,584	2,144	1,608	1,261	116	1	0	11,904
60 TO 64	418	821	1,282	2,053	1,861	1,203	678	260	40	0	8,616
65 TO 69	140	340	582	855	798	552	330	141	86	0	3,824
70 & UP	28	149	194	242	222	158	150	65	162	0	1,370
TOTAL	32,707	22,049	24,388	20,700	11,707	6,351	2,984	589	289	0	121,764

<i>SALARIES (IN THOUSANDS):</i>											
UNDER 20	0	0	0	0	0	0	0	0	0	0	0
20 TO 24	75,327	0	0	0	0	0	0	0	0	0	75,327
25 TO 29	689,983	133,618	387	0	0	0	0	0	0	0	823,988
30 TO 34	524,720	596,086	187,518	343	0	0	0	0	0	0	1,308,666
35 TO 39	290,287	350,507	744,605	178,397	186	0	0	0	0	0	1,563,982
40 TO 44	179,682	198,518	470,851	598,955	86,311	662	0	0	0	0	1,534,978
45 TO 49	136,716	139,288	289,259	476,023	385,546	72,650	1,434	0	0	0	1,500,916
50 TO 54	91,987	104,746	197,214	295,934	289,245	266,339	65,491	622	0	0	1,311,578
55 TO 59	55,538	69,640	153,198	230,451	217,017	186,464	154,437	14,385	159	0	1,081,289
60 TO 64	23,884	46,179	94,621	179,320	177,482	124,939	77,583	33,649	4,901	0	762,560
65 TO 69	7,977	17,442	40,772	72,511	72,606	56,937	33,899	17,700	10,810	0	330,654
70 & UP	1,095	5,692	12,368	18,656	18,607	14,276	14,605	6,407	18,758	0	110,466
TOTAL *	2,077,195	1,661,717	2,190,793	2,050,590	1,247,001	722,267	347,449	72,764	34,628	0	10,404,404

<i>AVERAGE SALARIES: **</i>											
UNDER 20	0	0	0	0	0	0	0	0	0	0	0
20 TO 24	52,713	0	0	0	0	0	0	0	0	0	52,713
25 TO 29	62,892	74,398	96,643	0	0	0	0	0	0	0	64,520
30 TO 34	66,538	83,067	95,235	114,201	0	0	0	0	0	0	76,827
35 TO 39	67,149	81,305	97,551	104,693	62,158	0	0	0	0	0	87,014
40 TO 44	64,541	76,915	94,624	106,519	113,121	110,303	0	0	0	0	91,734
45 TO 49	61,308	69,023	89,167	103,844	116,444	120,082	102,445	0	0	0	93,772
50 TO 54	59,809	63,138	79,779	96,964	111,034	120,027	118,858	88,916	0	0	93,000
55 TO 59	57,852	58,130	75,393	89,184	101,221	115,960	122,472	124,008	159,388	0	90,834
60 TO 64	57,140	56,248	73,808	87,345	95,369	103,856	114,430	129,421	122,518	0	88,505
65 TO 69	56,982	51,301	70,055	84,808	90,985	103,146	102,723	125,532	125,694	0	86,468
70 & UP	39,108	38,203	63,755	77,092	83,815	90,356	97,368	98,568	115,792	0	80,632
TOTAL	63,509	75,365	89,831	99,062	106,518	113,725	116,437	123,538	119,821	0	85,447

Note: Age is nearest birthday. Service is nearest year.

* Total may not add up due to rounding.

** Average based on unrounded salary.

Table XII-7
Detailed Reconciliation of Active Membership

TOTAL ACTIVE MEMBERS AS OF JUNE 30, 2018						TOTAL ACTIVE MEMBERS AS OF JUNE 30, 2017					
TIER	GENDER	NUMBER	SALARY	AVG SAL	AVG AGE	AVG SVC	NUMBER	SALARY	AVG SAL	AVG AGE	AVG SVC
I	M	72	9,174,927	127,430	75.4	42.0	99	11,845,551	119,652	74.1	41.2
I	F	155	18,247,033	117,723	72.2	39.5	200	22,900,307	114,502	71.0	37.7
		227	27,421,960	120,802	73.2	40.3	299	34,745,858	116,207	72.1	38.9
II	M	23	2,825,017	122,827	69.7	34.0	28	3,406,588	121,664	68.2	33.1
II	F	85	9,917,295	116,674	67.4	32.8	123	13,929,050	113,244	66.4	32.2
		108	12,742,312	117,984	67.9	33.0	151	17,335,638	114,806	66.7	32.4
IV	M	18,575	1,877,576,713	101,081	48.0	15.6	19,676	1,866,427,505	94,858	47.4	14.7
IV	F	63,722	5,906,583,325	92,693	48.1	15.7	66,780	5,823,268,154	87,201	47.5	14.9
		82,297	7,784,160,038	94,586	48.1	15.7	86,456	7,689,695,659	88,943	47.5	14.8
VI	M	8,699	588,470,371	67,648	35.1	2.8	7,509	481,047,376	64,063	34.6	2.4
VI	F	30,433	1,991,609,003	65,442	34.8	2.8	26,411	1,626,074,701	61,568	34.3	2.3
		39,132	2,580,079,374	65,933	34.9	2.8	33,920	2,107,122,077	62,120	34.4	2.4
ALL		121,764	10,404,403,684	85,447	43.9	11.6	120,826	9,848,899,232	81,513	43.9	11.4

MEMBERS WITH SAME GENDER AND TIER IN BOTH VALUATION YEARS						MEMBERS WITH SAME GENDER AND TIER IN BOTH VALUATION YEARS					
I	M	70	9,011,867	128,741	75.5	42.3	70	8,829,317	126,133	74.5	41.2
I	F	154	18,207,540	118,231	72.2	39.5	154	17,658,289	114,664	71.2	38.6
		224	27,219,407	121,515	73.2	40.4	224	26,487,606	118,248	72.2	39.4
II	M	23	2,825,017	122,827	69.7	34.0	23	2,828,389	122,973	68.7	33.0
II	F	84	9,818,042	116,881	67.5	32.9	84	9,623,135	114,561	66.5	31.9
		107	12,643,059	118,159	67.9	33.1	107	12,451,524	116,369	66.9	32.2
IV	M	18,270	1,852,492,693	101,395	48.0	15.7	18,270	1,749,033,558	95,733	47.0	14.5
IV	F	62,282	5,787,349,918	92,922	48.2	15.9	62,282	5,441,955,458	87,376	47.2	14.7
		80,552	7,639,842,611	94,844	48.2	15.8	80,552	7,190,989,016	89,271	47.2	14.7
VI	M	6,662	464,663,092	69,748	35.5	3.4	6,662	428,277,498	64,287	34.5	2.4
VI	F	23,897	1,604,067,231	67,124	35.3	3.3	23,897	1,469,145,112	61,478	34.3	2.3
		30,559	2,068,730,323	67,696	35.4	3.4	30,559	1,897,422,610	62,090	34.4	2.4
ALL		111,442	9,748,435,400	87,475	44.7	12.5	111,442	9,127,350,756	81,902	43.7	11.4

ADDITIONS DURING THE YEAR *						SEPARATIONS FROM MEMBERSHIP DURING THE YEAR *					
I	M	2	163,060	81,530	72.0	32.0	29	3,016,234	104,008	73.1	41.3
I	F	1	39,493	39,493	74.0	32.0	46	5,242,018	113,957	70.7	34.5
		3	202,553	67,518	72.7	32.0	75	8,258,252	110,110	71.6	37.1
II	M	0	0	0	0.0	0.0	5	578,199	115,640	66.2	33.6
II	F	1	99,253	99,253	64.0	24.0	39	4,305,915	110,408	66.3	32.9
		1	99,253	99,253	64.0	24.0	44	4,884,114	111,003	66.3	32.9
IV	M	305	25,084,020	82,243	45.2	10.1	1,406	117,393,947	83,495	53.0	16.5
IV	F	1,440	119,233,407	82,801	41.9	9.7	4,498	381,312,696	84,774	51.8	17.3
		1,745	144,317,427	82,703	42.5	9.8	5,904	498,706,643	84,469	52.1	17.1
VI	M	2,037	123,807,279	60,779	33.8	0.9	847	52,769,878	62,302	35.5	2.3
VI	F	6,536	387,541,772	59,293	33.1	0.9	2,514	156,929,589	62,422	34.4	2.3
		8,573	511,349,051	59,646	33.3	0.9	3,361	209,699,467	62,392	34.7	2.3
ALL		10,322	655,968,284	63,551	34.9	2.4	9,384	721,548,476	76,891	46.1	12.0

Note: Age is nearest birthday. Service is nearest year.

* Separations and additions do not include members who joined after June 30, 2017 and are no longer members on June 30, 2018.

Table XII-8
Summary of Non-Pensioner Membership as of June 30, 2018

STATUS	TIER 1		TIER 2		TIER 4		TIER 6		ALL TIERS	
	NUMBER	SALARY ¹	NUMBER	SALARY ¹	NUMBER	SALARY ¹	NUMBER	SALARY ¹	NUMBER	SALARY ¹
<i>MALES:</i>										
ACTIVES	72	9,174,927	23	2,825,017	18,575	1,877,576,713	8,699	588,470,371	27,369	2,478,047,028
ACTIVE OFF PAYROLL ²	13	1,362,206	6	706,616	959	53,729,858	733	43,850,002	1,711	99,648,682
VESTED	86	2,911,831	12	602,089	3,524	245,491,228	1	73,969	3,623	249,079,117
ALL STATUS	171	13,448,964	41	4,133,722	23,058	2,176,797,799	9,433	632,394,342	32,703	2,826,774,827
<i>FEMALES:</i>										
ACTIVES	155	18,247,033	85	9,917,295	63,722	5,906,583,325	30,433	1,991,609,003	94,395	7,926,356,656
ACTIVE OFF PAYROLL ²	23	2,465,550	22	2,391,575	4,163	293,668,737	2,445	147,932,405	6,653	446,458,267
VESTED	130	4,476,366	70	2,560,483	12,610	788,282,107	0	0	12,810	795,318,956
ALL STATUS	308	25,188,949	177	14,869,353	80,495	6,988,534,169	32,878	2,139,541,408	113,858	9,168,133,879
<i>TOTAL:</i>										
ACTIVES	227	27,421,960	108	12,742,312	82,297	7,784,160,038	39,132	2,580,079,374	121,764	10,404,403,684
ACTIVE OFF PAYROLL ²	36	3,827,756	28	3,098,191	5,122	347,398,595	3,178	191,782,407	8,364	546,106,949
VESTED	216	7,388,197	82	3,162,572	16,134	1,033,773,335	1	73,969	16,433	1,044,398,073
ALL STATUS	479	38,637,913	218	19,003,075	103,553	9,165,331,968	42,311	2,771,935,750	146,561	11,994,908,706

¹ Salary shown for Active Off Payroll and Vested members is the salary when last on payroll and has been assumed to be \$10,000 where unavailable.

² This table does not include members who are not vested and have either withdrawn or been off payroll for 5 years, and therefore are solely eligible to receive a refund of their member contributions. There are 1,052 such members who are otherwise included in the active off payroll category elsewhere in the report.

Table XII-9
Summary of Pensioner Membership

Group	June 30, 2018 (Lag)					June 30, 2017 (Lag)				
	Number	Annual Amounts Payable				Number	Annual Amounts Payable			
		Fixed	Variable	Supplement	Total		Fixed	Variable	Supplement	Total
Service Pensioners	78,364	\$ 3,250,114,740	\$ 569,353,093	\$ 160,186,959	\$ 3,979,654,792	76,973	\$ 3,149,422,220	\$ 549,709,742	\$ 156,101,208	\$ 3,855,233,170
Ordinary Disability Pensioners	2,640	53,650,002	3,593,988	4,362,164	61,606,154	2,549	50,836,063	3,468,955	4,142,076	58,447,094
Accidental Disability Pensioners	757	27,707,490	2,534,618	2,458,016	32,700,124	744	26,500,027	2,470,138	2,500,296	31,470,461
Accidental Death Pensioners	0	0	0	0	0	0	0	0	0	0
Other Beneficiaries	4,534	113,650,909	37,007,657	9,657,282	160,315,848	4,504	108,251,436	34,500,944	9,744,257	152,496,637
Total	86,295	\$ 3,445,123,141	\$ 612,489,356	\$ 176,664,421	\$ 4,234,276,918	84,770	\$ 3,335,009,746	\$ 590,149,779	\$ 172,487,837	\$ 4,097,647,362

Table XII-10
Distribution of Pension Benefits by Cause and Age as of June 30, 2018

AGE	MALE			FEMALE			TOTAL		
	NUMBER	BENEFITS	AVERAGE	NUMBER	BENEFITS	AVERAGE	NUMBER	BENEFITS	AVERAGE
<i>SERVICE RETIREMENT:</i>									
UNDER 30	0	0	0	0	0	0	0	0	0
30 TO 34	0	0	0	0	0	0	0	0	0
35 TO 39	0	0	0	0	0	0	0	0	0
40 TO 44	0	0	0	0	0	0	0	0	0
45 TO 49	0	0	0	0	0	0	0	0	0
50 TO 54	0	0	0	0	0	0	0	0	0
55 TO 59	626	33,657,845	53,767	1,807	96,239,033	53,259	2,433	129,896,878	53,390
60 TO 64	1,664	87,244,002	52,430	5,618	275,827,080	49,097	7,282	363,071,082	49,859
65 TO 69	3,559	195,051,158	54,805	11,932	602,571,380	50,500	15,491	797,622,538	51,489
70 TO 74	6,981	451,357,199	64,655	13,780	726,197,488	52,699	20,761	1,177,554,687	56,720
75 TO 79	4,105	245,092,765	59,706	9,574	443,893,165	46,364	13,679	688,985,930	50,368
80 TO 84	2,527	144,683,977	57,255	5,863	238,766,538	40,724	8,390	383,450,515	45,703
85 TO 89	1,652	93,329,855	56,495	4,143	163,301,482	39,416	5,795	256,631,337	44,285
90 & UP	1,080	56,361,018	52,186	3,453	126,080,807	36,513	4,533	182,441,825	40,247
TOTAL	22,194	1,306,777,819	58,880	56,170	2,672,876,973	47,585	78,364	3,979,654,792	50,784
<i>ORDINARY DISABILITY:</i>									
UNDER 30	0	0	0	0	0	0	0	0	0
30 TO 34	0	0	0	0	0	0	0	0	0
35 TO 39	1	25,886	25,886	7	190,638	27,234	8	216,524	27,066
40 TO 44	8	216,196	27,025	34	815,595	23,988	42	1,031,791	24,566
45 TO 49	24	645,946	26,914	89	2,330,641	26,187	113	2,976,587	26,341
50 TO 54	30	894,284	29,809	140	3,751,305	26,795	170	4,645,589	27,327
55 TO 59	64	1,795,135	28,049	291	7,357,288	25,283	355	9,152,423	25,781
60 TO 64	86	2,139,207	24,875	392	8,989,724	22,933	478	11,128,931	23,282
65 TO 69	115	2,889,901	25,130	419	9,438,189	22,526	534	12,328,090	23,086
70 TO 74	119	3,172,060	26,656	345	7,553,145	21,893	464	10,725,205	23,115
75 TO 79	61	1,535,421	25,171	193	3,471,697	17,988	254	5,007,118	19,713
80 TO 84	26	553,859	21,302	92	1,588,562	17,267	118	2,142,421	18,156
85 TO 89	11	305,075	27,734	43	754,348	17,543	54	1,059,423	19,619
90 & UP	8	241,512	30,189	42	950,540	22,632	50	1,192,052	23,841
TOTAL	553	14,414,482	26,066	2,087	47,191,672	22,612	2,640	61,606,154	23,336
<i>ACCIDENTAL DISABILITY:</i>									
UNDER 30	0	0	0	0	0	0	0	0	0
30 TO 34	0	0	0	1	40,124	40,124	1	40,124	40,124
35 TO 39	1	37,648	37,648	2	77,363	38,682	3	115,011	38,337
40 TO 44	5	258,835	51,767	7	295,295	42,185	12	554,130	46,178
45 TO 49	7	319,720	45,674	15	660,090	44,006	22	979,810	44,537
50 TO 54	4	239,804	59,951	26	1,202,479	46,249	30	1,442,283	48,076
55 TO 59	14	593,444	42,389	52	2,179,668	41,917	66	2,773,112	42,017
60 TO 64	21	1,206,851	57,469	84	3,384,139	40,287	105	4,590,990	43,724
65 TO 69	30	1,331,304	44,377	122	5,203,808	42,654	152	6,535,112	42,994
70 TO 74	68	3,295,109	48,457	117	4,701,981	40,188	185	7,997,090	43,228
75 TO 79	28	1,347,712	48,133	51	2,370,078	46,472	79	3,717,790	47,061
80 TO 84	15	709,850	47,323	38	1,202,664	31,649	53	1,912,514	36,085
85 TO 89	7	278,872	39,839	22	838,888	38,131	29	1,117,760	38,543
90 & UP	7	309,640	44,234	13	614,758	47,289	20	924,398	46,220
TOTAL	207	9,928,789	47,965	550	22,771,335	41,402	757	32,700,124	43,197

Table XII-10
Distribution of Pension Benefits by Cause and Age as of June 30, 2018 (cont'd)

AGE	MALE			FEMALE			TOTAL		
	NUMBER	BENEFITS	AVERAGE	NUMBER	BENEFITS	AVERAGE	NUMBER	BENEFITS	AVERAGE
<i>ACCIDENTAL DEATH:</i>									
UNDER 30	0	0	0	0	0	0	0	0	0
30 TO 34	0	0	0	0	0	0	0	0	0
35 TO 39	0	0	0	0	0	0	0	0	0
40 TO 44	0	0	0	0	0	0	0	0	0
45 TO 49	0	0	0	0	0	0	0	0	0
50 TO 54	0	0	0	0	0	0	0	0	0
55 TO 59	0	0	0	0	0	0	0	0	0
60 TO 64	0	0	0	0	0	0	0	0	0
65 TO 69	0	0	0	0	0	0	0	0	0
70 TO 74	0	0	0	0	0	0	0	0	0
75 TO 79	0	0	0	0	0	0	0	0	0
80 TO 84	0	0	0	0	0	0	0	0	0
85 TO 89	0	0	0	0	0	0	0	0	0
90 & UP	0	0	0	0	0	0	0	0	0
TOTAL	0	0	0	0	0	0	0	0	0
<i>OTHER BENEFICIARIES:</i>									
UNDER 30	1	4,736	4,736	5	115,448	23,090	6	120,184	20,031
30 TO 34	7	137,953	19,708	4	33,260	8,315	11	171,213	15,565
35 TO 39	6	130,228	21,705	11	249,221	22,656	17	379,449	22,321
40 TO 44	14	323,071	23,077	18	355,305	19,739	32	678,376	21,199
45 TO 49	15	293,064	19,538	19	338,645	17,823	34	631,709	18,580
50 TO 54	23	318,324	13,840	43	602,020	14,000	66	920,344	13,945
55 TO 59	35	522,480	14,928	83	1,951,912	23,517	118	2,474,392	20,969
60 TO 64	51	1,461,644	28,660	108	3,316,275	30,706	159	4,777,919	30,050
65 TO 69	114	3,184,484	27,934	278	11,250,043	40,468	392	14,434,527	36,823
70 TO 74	209	7,583,051	36,283	443	19,026,729	42,950	652	26,609,780	40,813
75 TO 79	213	7,384,248	34,668	570	23,911,413	41,950	783	31,295,661	39,969
80 TO 84	183	5,338,196	29,170	504	21,150,946	41,966	687	26,489,142	38,558
85 TO 89	174	4,855,458	27,905	522	19,377,825	37,122	696	24,233,283	34,818
90 & UP	272	7,342,172	26,993	609	19,757,697	32,443	881	27,099,869	30,760
TOTAL	1,317	38,879,109	29,521	3,217	121,436,739	37,748	4,534	160,315,848	35,359
<i>ALL PENSIONERS AND BENEFICIARIES:</i>									
UNDER 30	1	4,736	4,736	5	115,448	23,090	6	120,184	20,031
30 TO 34	7	137,953	19,708	5	73,384	14,677	12	211,337	17,611
35 TO 39	8	193,762	24,220	20	517,222	25,861	28	710,984	25,392
40 TO 44	27	798,102	29,559	59	1,466,195	24,851	86	2,264,297	26,329
45 TO 49	46	1,258,730	27,364	123	3,329,376	27,068	169	4,588,106	27,149
50 TO 54	57	1,452,412	25,481	209	5,555,804	26,583	266	7,008,216	26,347
55 TO 59	739	36,568,904	49,484	2,233	107,727,901	48,244	2,972	144,296,805	48,552
60 TO 64	1,822	92,051,704	50,522	6,202	291,517,218	47,004	8,024	383,568,922	47,803
65 TO 69	3,818	202,456,847	53,027	12,751	628,463,420	49,287	16,569	830,920,267	50,149
70 TO 74	7,377	465,407,419	63,089	14,685	757,479,343	51,582	22,062	1,222,886,762	55,430
75 TO 79	4,407	255,360,146	57,944	10,388	473,646,353	45,596	14,795	729,006,499	49,274
80 TO 84	2,751	151,285,882	54,993	6,497	262,708,710	40,435	9,248	413,994,592	44,766
85 TO 89	1,844	98,769,260	53,563	4,730	184,272,543	38,958	6,574	283,041,803	43,055
90 & UP	1,367	64,254,342	47,004	4,117	147,403,802	35,804	5,484	211,658,144	38,596
TOTAL	24,271	1,370,000,199	56,446	62,024	2,864,276,719	46,180	86,295	4,234,276,918	49,067

Graph XII-11
Pensioner Average Benefits

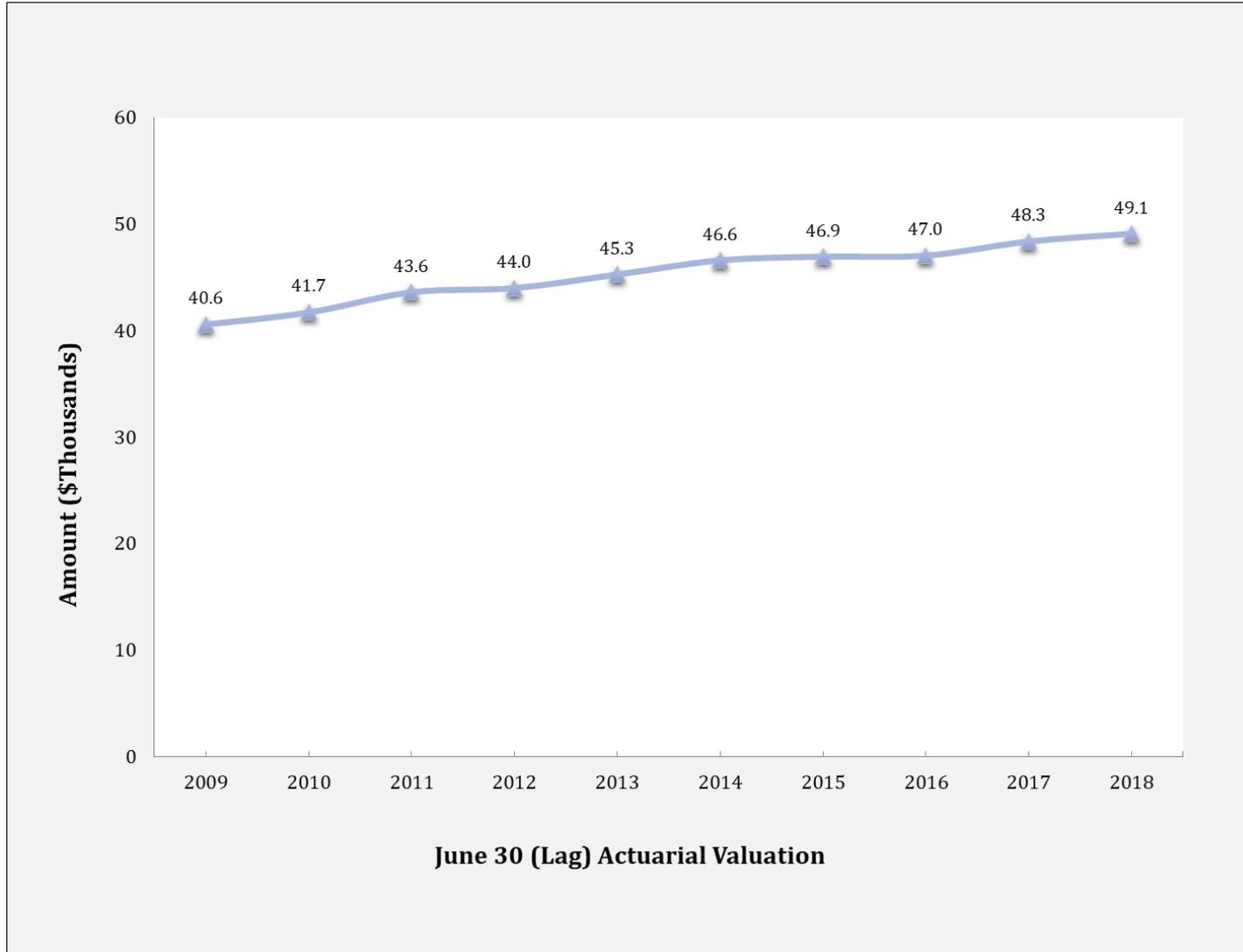


Table XII-12
Reconciliation of Pensioner and Beneficiary Data

SCHEDULE OF PENSIONERS AND BENEFICIARIES ADDED TO AND REMOVED FROM THE ROLLS								
June 30 (Lag) Actuarial Valuation	Added to Rolls		Removed from Rolls		End of Year Rolls		% Increase in Annual Allowances	Average Annual Allowances
	Number	Annual Allowances ¹	Number	Annual Allowances	Number	Annual Allowances ²		
2009	3,115	\$6,288,013	2,065	\$73,586,895	70,825	\$2,874,313,269	- 2.3%	\$40,583
2010	3,534	207,981,284	2,003	64,538,942	72,356	3,017,755,611	5.0%	41,707
2011	3,849	278,652,149	2,141	67,488,320	74,064	3,228,919,440	7.0%	43,596
2012	4,684	200,786,572	2,209	62,805,438	76,539	3,366,900,574	4.3%	43,989
2013	4,078	248,087,233	2,440	77,107,240	78,177	3,537,880,567	5.1%	45,255
2014	4,356	275,947,759	2,114	67,585,789	80,419	3,746,242,537	5.9%	46,584
2015	4,728	219,769,491	2,370	81,986,287	82,777	3,884,025,741	3.7%	46,922
2016	3,808	157,518,432	2,492	86,890,450	84,093	3,954,653,723	1.8%	47,027
2017	3,519	254,567,439	2,842	111,573,800	84,770	4,097,647,362	3.6%	48,338
2018	4,107	240,586,776	2,582	103,957,220	86,295	4,234,276,918	3.3%	49,067

¹ Amounts shown include changes due to benefit finalization, changes in benefit type (e.g. Service to Accident Disability), COLA increases and other changes.

² Allowances shown are those used in the actuarial valuation as of the Year End date and are not adjusted for anticipated changes due to the finalization of benefit calculations or contract settlements.

APPENDIX: ACRONYMS AND ABBREVIATIONS

2019 A&M	Actuarial Assumptions and Methods proposed by the Actuary and adopted by the Board of Trustees during Fiscal Year 2019
AAVM	Actuarial Asset Valuation Method
ACCNY	Administrative Code of the City of New York
AIR	Actuarial Interest Rate
AL	Accrued Liability
AMC	Additional Member Contribution
ASAF	Annuity Savings Accumulation Fund
AVA	Actuarial Value of Assets
AVR	Asset Volatility Ratio
BMC	Basic Member Contribution
CAFR	Comprehensive Annual Financial Report
COLA	Cost-of-Living Adjustment
EAN	Entry Age Normal cost method
EIR	Expected Investment Return
FAS	Final Average Salary
FS	Final Salary
GASB	Governmental Accounting Standards Board
GASB25	Governmental Accounting Standards Board Statement No. 25
GASB67	Governmental Accounting Standards Board Statement No. 67
GASB68	Governmental Accounting Standards Board Statement No. 68
IRC	Internal Revenue Code
MVA	Market Value of Assets
OYLM	One-Year Lag Methodology
PV	Present Value
PVFB	Present Value of Future Benefits
PVFC	Present Value of Future Normal Costs
PVFS	Present Value of Future Salary
TDA	Tax-Deferred Annuity Program
TRS	New York City Teachers' Retirement System
UAL	Unfunded Accrued Liability
UIR	Unexpected Investment Return
WTC	World Trade Center